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COMMUNICATION WITH IRELAND.

RETURN to an Order of the Honourable The House of Commons, dated 16 February 1844;—*for*,

COPY of REPORT on HOLYHEAD and PORT DYNLLAEN HARBOUR, by Captain BACK and Captain FAIR, to the Lords Commissioners of the Admiralty.

COPY of REPORT of JAMES WALKER, Esq., Civil Engineer, to the Lords Commissioners of the Admiralty.

(*Mr. Chancellor of the Exchequer.*)

Ordered, by The House of Commons, *to be Printed,*
19 *February* 1844.

REPORT by CAPTAIN BACK and CAPTAIN FAIR - - - - - - - p. 3
REPORT by JAMES WALKER, Esq. - - - - - - - - - p. 5

REPORT on Holyhead and Port Dynllaen Harbour, by Captain Back and Captain Fair.

Sir, Holyhead, June 9, 1843.

In obedience to the commands of the Lords Commissioners of the Admiralty, conveyed in your letter of the 21st May, desiring that we should proceed to Holyhead and Port Dynllaen to examine those harbours on the spot, with reference to their capability and position, for the purpose of ascertaining which, in our opinion, is the most eligible to be established as the port of communication with Dublin for the packet, &c., we have the honour to acquaint you, for the information of their Lordships, that we have proceeded to and examined those places by land and sea, and without bias of any kind, from local interests or otherwise, but having regard solely to the quickest transit, consistent with safety, from one side of the Channel to the other, have given the subject, and all that bears upon it, our best and most attentive consideration.

As regards Port Dynllaen, we have to report as follows:—

1st. Forming, as it does, a small inner bay or cove within Carnarvon Bay, it is entirely exposed to the winds blowing from all points, between north-west by north and north-east, and though sheltered from the prevailing south-west winds, yet the gusts from the land are said to rush down with such violence between the mountains, and more especially from the two principal hills, called the Rivals, as to endanger the safety of small vessels endeavouring to get in with the land.

2d. Port Dynllaen has no good leading mark to guide to the anchorage, for though the Rivals are conspicuous enough in fine weather, yet, during the settled fogs and occasional mista, which are here not uncommon, the adjoining mountains are so nearly alike, that the most experienced person might be deceived, and thus brought into difficulty and danger.

Our own observation and inquiries confirmed the impression which we received from the aspect of the coast, and led us to the conclusion that, as well in thick weather as during occasional storms, Port Dynllaen was liable to be, and was, in fact, obscured, whilst Holyhead was comparatively free and clear.

3d. After maturely considering and endeavouring clearly to estimate the position of Port Dynllaen with regard to the prevailing south-west wind, the nature of the flood tide, and the long ebb tide of eight hours, causing an indraught into and sweeping round the whole of Carnarvon Bay; and the necessity, or, at least, the prudence of making the passage by the north of the Kishlight: we do not perceive any advantage that could be gained by starting from that port. Whilst on the other hand are to be taken into account the risks inseparable from a deep tidal bay, foggy weather, and occasionally a lee shore.

For these and other reasons, we have come to the conclusion, that Port Dynllaen is not in itself eligible as a port of communication with Dublin.

We have formed this opinion independently of other considerations to which our attention was not so directly called; but which, nevertheless, it would not be proper wholly to overlook. We mean the particular site of the port, and its capability for the erection of buildings, such as would be indispensable for a regular packet establishment.

On this subject we would only remark, that there is no space between the beach, and the precipitous banks of earth and sand, which rise above it to the height of a hundred to one hundred and twenty feet, for more than one, or, perhaps in a favourable spot, two houses abreast; and that the construction of docks could only be achieved by great labour and still greater outlay.

Such being our conclusion as to the unfitness of Port Dynllaen for a packet station, we do not feel called upon to offer any observations on its eligibility or capacity for a harbour of refuge.

Of the harbour of Holyhead, we have to report as follows:—

The bay of Holyhead seems formed by nature for a place of shelter, and if there be any thing still wanting to make it complete, the defect may be easily supplied.

Point Carmel and the Skerries on one side, and Holyhead and South Stack on the other, render the entrance equally easy and certain, by day and by night; and the light at the extremity of the pier is a sure guide into the harbour.

The Race off the head would only be formidable during a strong opposing wind and tide, and, on the other hand, it becomes of the utmost use in dense fogs, by indicating at once the correct place of the vessel, and thus enabling her to make for her port.

The Stag Rock lies out of the course of the packets, which almost invariably round the buoy of the outer Platters, in preference to passing within them, as may be done at certain times of the tide; but, if even by any accident the packets should go further out, they would always find fifteen feet at low water; a depth more than sufficient, under all circumstances, to float them over that rock, without danger.

We do not discover any thing else which could even be deemed to be an obstruction to the free passage of a steamer in or out of Holyhead; and, with respect to the crossing of the Channel, and the time required for doing it, making all due allowance for winds, tides and adverse weather, we are clearly of opinion that it can be performed on an average nearly an hour sooner, and consequently with less consumption of fuel, from this port than from Port Dynllaen.

Above all, we cannot forbear laying much stress on the advantage of so conspicuous a land-mark as Holyhead, which being generally free from clouds, and standing boldly out, apparently isolated from the neighbouring hills, is soon descried and made for with the greatest confidence.

Finally, although it appears that the packets, through a period of 13 years, have been occasionally detained a few hours by strong gales, yet in no instance, so far as we can learn, have they ever failed in conveying the regular mails to and from Kingstown, nor is there, we believe, a single loss on record.

It is, therefore, our unqualified opinion, that both as to "capability and position," Holyhead is unquestionably the most "eligible" harbour on the coast as a port of communication with Dublin.

Having thus answered, to the best of our abilities, the question proposed to us by their Lordships, it may not be irrelevant to add a few words on the present state of the inner harbour of Holyhead, and we would respectfully suggest, that it requires only to be deepened by dredging and excavating, and the removal of the comparatively few rocks, cropping out of the mud, to render it perfectly available for every purpose that can be desired.

And although the consideration of such alterations and improvements belongs more properly to the province of the civil engineer, we should not think that we had entirely fulfilled our duty were we to refrain from expressing a hope, that the proposed plans for the formation of an outer harbour, as supplied to us from their Lordships' office, should be acted on.

Holyhead would then, in our judgment, become an excellent refuge harbour, and as such would be of incalculable use to vessels sailing along the rocky and dangerous coast of North Wales.

We have the honour to be, Sir,
Your obedient servants,

The Hon. Sidney Herbert,
&c. &c. &c.

Geo. Back, Captain.
Rob. Fair, Captain.

APPENDIX.

DESCRIPTION of the BORINGS in the HARBOUR of HOLYHEAD, by direction of the Admiralty, 1840.

No. of the Hole on the Plan.	Depth bored.		Bottom found.	Quality of Substratum.	Height of the Surface of the Mud over Low Water common Spring Tides.	
	Ft.	in.			Ft.	in.
No. 1 -	14	4	Rock -	- - First 14 feet, sand, coarse gravel and clay; the remainder pure tenacious clay	8	6
„ 2 -	31	–	No Rock	- - - ditto - - - -	3	–
„ 3 -	34	4	Rock -	- - - ditto - - - -	3	6
„ 4 -	20	–	Rock -	- - - ditto - - - -	2	–
„ 5 -	18	–	Rock -	- - - ditto - - - -	1	9
„ 6 -	29	6	Rock -	- - - ditto - - - -	1	–

PLAN OF THE HARBOUR OF HOLYHEAD.

REPORT of J. WALKER, Esq., Civil Engineer.

To Sir *John Barrow*, Bart., Secretary to the Admiralty.

Sir,

YOUR instructions, dated 20th June last, and addressed to me by order of the Lords Commissioners of the Admiralty, are, "That I proceed, as soon as in my power, to Holyhead and Porth-dyn-llaen, to examine those places with reference to their capability and position, and the natural facilities which each may afford for the formation of a harbour, with a view to ascertain which, in my opinion, is the most eligible to be established as the packet station and port of communication with Dublin. Instructions.

"That I ascertain with which of the two ports above-named there may exist the greatest facility for railway communication with London, regard being had to the comparative cost of effecting such communication, and the other considerations bearing on the point.

"That I make plans, with an estimate of the cost of constructing or improving at each place, a harbour and works necessary for a packet station, for vessels of the class now running between Liverpool and Kingstown; namely, of 900 tons, and drawing 10 feet 10 inches water, and for a refuge harbour for the Channel trade."

The whole of the papers on this subject then before the Admiralty were, as stated by your letter, delivered to me to assist in the investigation; and I was informed that orders had been given to Commander Kaines, at Holyhead, to place a steamer at my disposal, and to give me any other facilities in his power during my inquiries at that place and at Porth-dyn-llaen. I was further "requested to report, as soon as might be consistent with the due consideration of the subject, which of the two harbours I might prefer for the purposes before mentioned, accompanying my proposals with plans and estimates, and setting forth in detail the reasons upon which my opinion should be founded."

The papers above referred to having informed me who were the projectors of the lines of railway to Holyhead and Porth-dyn-llaen, and the supporters of the harbour schemes, I lost no time in informing these parties of the reference to me, and of my readiness to receive any information beyond that afforded by the documents, or to accompany them upon their respective lines; and, with one exception, I have at different times had explanatory correspondence or conferences with all the parties.

My first journey and survey were made at the end of June and beginning of July, when Surveys. I examined Mr. Stephenson's and Mr. Giles' lines of railway from Chester to Holyhead, so far as the documents which I had received from the Admiralty enabled me. I also surveyed the harbour of Holyhead, and received information and statements from those who were supposed best qualified to give them respecting the advantages and imperfections of that place. Then I proceeded to Porth-dyn-llaen,* which I examined, and took the evidence of several individuals (pilots, shipmasters and others), as to the facilities of that harbour. On this occasion I examined the rocks from which the stone for the construction of the harbour was proposed to be taken. I then returned to Holyhead.

On the 3d of July, Commander Tudor, R. N., arrived at Holyhead, having been sent down to meet me by Mr. Archer, a gentleman who feels a strong interest in Porth-dyn-llaen. I accompanied Commander Tudor over the harbour, and on the following day went with him to Porth-dyn-llaen† that I might afford him facility for his visiting that place, and have the advantage of his observations. I left Commander Tudor at Porth-dyn-llaen, and returned to Holyhead, and then back by the coast.

For the following six weeks I was engaged almost daily, with my assistant, Mr. Cooper, who had been with me upon my surveys in preparing designs and estimates, and conferring or corresponding with the various parties who are interested in the matters referred to me.

Having now received from the Treasury the railway plans, sections and other documents which had been referred to Sir Frederick Smith and Professor Barlow, I proceeded, on the 25th of August, with a more minute examination of the different coast lines to Bangor, and then across Anglesea to Holyhead, which I again visited. On my return I surveyed the Menai Straits, near the bridge, and then the projected line for a railway from the coast line at Bangor to near Caernarvon, and on to Porth-dyn-llaen. This is the only plan of railway communication to Porth-dyn-llaen which I have seen, to connect that harbour with London, which it does by the Chester and Bangor or coast line. There have been inland surveys through Wales in various directions, but not one of them commences at Porth-dyn-llaen or at Holyhead, and terminates at an existing railway to London, nor have I the materials for completing the chain of communication. I stated to the parties principally interested, the desirableness of having a connected plan of a line through the interior of North Wales, if this was intended to be offered as a rival to the coast line; and after considerable delay, the survey for this is now in progress, chiefly under the auspices of the Great Western Railway Company, and some of the principal proprietors in the inland counties of North Wales. My present report will, therefore, be deficient in the comparison of railway lines, and I shall take the earliest opportunity of supplying the deficiency, when I receive the necessary plans and sections to enable me to examine the line that may be preferred for this inland route. The Welsh interests are naturally anxious not to lose the present chance of having a railway through their counties; and, in a public view, I consider the present decision important, for if a case cannot be shown, which will give the inland route a preference for the Post-office communication from London to the coast, and to Ireland, it is likely to be very long indeed before that thinly peopled and mountainous part of the country has the advantage of railway communication. On the other hand, even if the inland or southern line were made, the trade, wealth and influence of Manchester, the north of England, Scotland and partially Liverpool, would probably be sufficient to ensure, ere long, the formation of the coast or north line.

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* In the Zephyr, Lieutenant Smail.

† In the Otter, Lieutenant Jones.

I have seen Commander Tudor since his return to town from Porth-dyn-llaen, but have not yet received from him the report of his survey and his opinion. The importance of the general question, and the pressing applications to me from various quarters for my report, do not justify my longer delaying to state my opinion on the facts I have ascertained of the advantages and capabilities of Holyhead and Porth-dyn-llaen for a packet station and harbour, and of the coast line of railway to both harbours, for the communication between London and Dublin, but I crave leave to make such further modification as to comparative merits, as the reports I may receive of the south line, and of Captain Tudor's observations of Porth-dyn-llaen harbour, may in justice require of me. I would remark, and have stated to the parties, that as Porth-dyn-llaen may be reached either by the inland railway or by the line between Chester and Bangor, so Holyhead may, perhaps, be reached, either by the coast line of railway crossing the Menai Straits near Bangor, or by an inland line through Shrewsbury or Worcester, crossing the Straits into Anglesea near Caernarvon.

Holyhead.

I now proceed in the order pointed out to me in your letter. First, to give my opinion of Holyhead for a packet station, and also for a harbour of refuge, these being two distinct questions. My instructions may be taken as having reference chiefly to the engineering part of the subject; but it was impossible for me to do justice to this, without extending my consideration out to sea, and even across the channel, and considering how the day and night beacons, the land-marks, and the shoals, affect the passage and the entrance into the harbour. I have therefore examined the charts and perused the reports on this subject, particularly that of Sir James Gordon and Captain Beechey, which, with the observations on the petition of Mr. Ormsby Gore and others, and the replies to these observations, together with the opinions of the various naval officers, including Lieutenant Sheringham, appear to me to have completely exhausted the naval part of the question, and must be well known to the Lords of the Admiralty, and all who have attended to the subject, so that very little need be said by me on that head. The natural advantages of Holyhead are described to consist of its being the nearest point of land to Dublin, being situated under a projecting and very conspicuous headland, giving facilities for keeping out at sea in case of missing or being unable to enter the harbour, the Skerries forming another good sea-mark, the entrance being free from bar, and the shelter which the bay affords to vessels from all winds, excepting between north-west and north-north-east.

This bay, and the shallow inlet now forming the inner Holyhead harbour, appear always to have been a shelter for coasters; and the creation of a town there, before art had done almost anything to assist nature, confirms the opinion. It was not until 1715, that a light was shown upon the Skerries, nor was the South Stack lighted until 1809. These lights being one on each side of the harbour, at the distance of eight miles from each other, together with the pier and the excellent light upon it, between the two outer leading lights, have much added to the natural advantages of Holyhead, and mark the direct course to, and the entrance into, the harbour in a superior manner.

The Stag Rock, which has now 15 feet upon it at low water of spring tides, and the Platters, which are within half a mile of the shore, are the only sunk rocks in the direct course of the entrance. There is one uninterrupted course, clear of shoals, between Holyhead and Kingstown, with the exception of the Burford Bank, which has upon the shoalest part two fathoms at low-water spring tides.

The prominent disadvantages of the Roadstead of Holyhead in its present state, as a harbour of refuge, are, that the bottom of the bay is bad holding ground, so that vessels at anchor there are exposed, during heavy northerly gales, to great danger of their anchors dragging, and their being driven upon the rocks, which, with some exception, encompass the bay; also, that from the pier pointing so much towards the shore, there is not room for a vessel to work in with a strong westerly, or to get out with an easterly wind, without danger of getting upon the rocks. I have not received a list of the losses and damage that have occurred. The depth alongside the pier for 300 feet is 10 feet at low water; this decreases rapidly, leaving but little space, even near the entrance covered with water at low water of spring tides, and one-half of the inner harbour is dry before half ebb.

As a harbour of refuge, therefore, Holyhead has at present but little pretensions, and yet it is much used by wind-bound coasters. I was informed by Captain Evans, the Harbour Master, that during the three first months of this year, 394 vessels used the harbour and roadstead for shelter, or being wind-bound or laid up.

As a mail-packet station, Holyhead has, even now, much to boast of. The certainty indeed has been extraordinary. Lieutenant Jones informed me that during the six years he has been on the station, there has been no instance of his packet, in the very worst weather, not having started so soon as the mail was on board, or of having put back after having started, or of being unable to enter after approaching the harbour. A few of the crossings have, however, been long. During the six years he has had one passage of 21 hours, and two or three of 18 hours. Commander Kaines also, the agent for all the packets, stated that the Holyhead packets had never missed starting, and that they can make the passage in all weathers. Lieutenant Smail, of the "Zephyr," said, that, excepting about six times in winter, during excessive gales, his longest time has been 7¾ hours, the quickest 5¾, and the average 6¾ hours. This information, added to the letters which are attached to Sir James Gordon and Captain Beechey's Report, from the same, and from other officers who had left the station, is very strong as an argument in favour of Holyhead, in even its present state.

I have appended to this Report a copy of the letters which you have lately sent me from the officers now commanding the Liverpool and Dublin Government and other packets; also the evidence of Mr. Robert Thomas, now commanding a steamer between Rhyl and Liverpool, who is in favour of Holyhead; also that of Mr. Thomas Thomas, master of a schooner in the slate trade out of Caernarvon, who is decidedly for Porth-dyn-llaen; and I believe, from the inquiries I have made, that the majority of masters in the same trade would give a similar opinion.

That the present regularity and despatch would be still added to by more powerful packets and an improved packet station, cannot be doubted; and I beg now to refer you to the accompanying design for improving and enlarging Holyhead harbour. It may be considered as of three divisions:—

Plans for Holyhead.

Firstly. A steam-packet pier, sufficient to give good accommodation to the proposed larger packets.

Secondly. A breakwater pier, to form, upon a cheaper plan, a shelter to shipping from the northerly winds.

And, thirdly. The further extension of the landing-pier in the same direction as before, and returning the end over the Stag Rock, towards the termination of the breakwater, thus forming an inclosed harbour for refuge and the convenience of trade.

Each of these stages may be considered an independent work, and would be useful without the other. The third or last division is a large work.

Returning to the packet-pier (lettered A. B. on the design No. 1), its direction will be east-by-south nearly;* its length 700 feet, and width 80 feet—both sides walled and faced with ashlar, as the north side will form also one side of the future harbour. The depth at low-water spring tides, at the inner end, 12 feet, and at the outer end 18 feet. A return jetty of 100 feet is proposed at the outer end.

	£.
The estimate of this division is - - - - - - - -	78,000
Second, The breakwater (lettered E. F. G. on the drawing, No. 1.) is designed to be carried out from the rocks at the north end of Salt Island, in an east by south straight direction, 500 yards, and there returned by a curve to a southerly direction. Its termination or head will bear north-east by north of the Stag Rock, from which it will be distant 250 yards. This arm, as will be seen by the Plan, will shelter a large space (upwards of 70 acres) from all the heavy seas to which it is open. The low-water depth, excepting for a very small space on the west side, will exceed 18 feet, the average being 24 feet. It will also protect the north side of the steam packet pier, so that vessels may come alongside it. The estimate of this work, including the removal of the Inner Platters, is - -	177,000
These two works, therefore, amount to - - - - - -	£. 255,000
By the third division, it is proposed to extend the packet-pier 750 feet (from B. to C. on the drawing, No. 1,) and to project a jetty 150 feet to the southward. Thus the present pier, with the pier before described, and this extension, will form the south side of the harbour of refuge. A return in a north-east by north direction for a length of 900 feet, (lettered C. D. on the drawing, No. 1,) will leave an entrance of 300 or 350 feet wide between it and the termination of the breakwater, making a complete harbour of refuge of about 80 acres, in which the large class ships will be afloat at the lowest water. The cost of this work will be - - -	145,000
The amount of the three works is thus - - - - - - -	£. 400,000

When they are done, the accommodation will be of the first order for steamers, the length of deep water quay being not less than 3,900 feet, of which 2,200 feet are within the inclosed harbour. There will also be an excellent harbour of refuge, which ships of the largest class may enter and leave with almost all winds, be always afloat, and in perfect safety while in the harbour.

As I before said, each may be finished independently of the other, and each will be most useful after its kind, but not perfect as a whole, because the breakwater alone would not give such complete refuge as when made an inclosed harbour by the completion of the third division. The two first divisions, amounting to 255,000 *l.* correspond nearly with what I have afterwards to submit for Porth-dyn-llaen, where an inclosed harbour is not proposed.

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* The bearings are all by compass.

Holyhead harbour, thus made, would be less in point of area than Kingstown, but it would be superior in point of accommodation for steamers, and would possess the advantage of an entrance protected against all winds, which Kingstown does not. Holyhead has also the advantage of a good graving dock, and an establishment upon the Crown estate for fitting up and repairing the machinery of the packets. The present inner harbour, though shallow, is useful, and will continue to be so for small craft; its area at high water is about 75 acres. I have drawn a straight line along the west side of the proposed harbour of refuge. This frontage will belong to the Crown, and if a wall were built in that line and the reclaimed space added to the Government yard, the present area of that establishment would be nearly tripled. Her Majesty's steam or other vessels might be brought into the harbour for examination and repair; part of the space on the west side of the harbour might be used for graving docks, slips and other conveniences.

Having already described the disadvantages of Holyhead in its present state, it is but justice to say now, that I think the works I have just described will almost entirely remove them. Thus, the bad holding ground outside the harbour will be of very little consequence, if vessels, by entering the harbour, have little or no occasion to anchor outside; and the same reason renders the rocks round the bay comparatively harmless. I am not aware that in my department there can be an objection to the plan but the expense; and as doubling the expense quadruples the area, and diminishes the swell, I consider that if made at all, the harbour should be capacious.

A passing toll of one half-penny per ton would produce 10,000 *l.* per annum, but this would probably be objected to by the trade. Considerable revenue might be derived from ships using the harbour for shelter; and perhaps it is not speculating too largely to expect, that the safe access and speedy communication with the capital may tempt ships, particularly during contrary winds, to go into Holyhead for landing their passengers and valuable goods of small bulk, and that passengers may prefer embarking there to higher up the channel. There would be ample quay room for the accommodation of such vessels.

To bring the railway down to the quay, the passage into the inner harbour on the west side of Salt Island would have to be crossed, which may be done, and the passage filled up for this purpose, without injury, compared with the advantage of bringing the mail and passengers quite down to the steamers. The inconvenient distance from the starting point is at present complained of when the packets arrive or leave after dark.

Porth-dyn-llaen.

Having thus given my opinion of Holyhead, with its capability of improvement, I have now to state the result of my observations upon Porth-dyn-llaen. Its present state may be considered as a state of nature, scarcely anything having been done to improve it; nor does it appear that any one connected with shipping has thought it his interest to settle or build near it for furnishing supplies to the vessels that may have frequented it. There is no shop or store of any kind nearer than Edern (one mile), nor is there the appearance of there having been one; a proof that if on occasions a great number of ships have taken advantage of the harbour, these occasions have not been frequent, or the ships must have remained a very short time. Yet this may not be conclusive against Porth-dyn-llaen having important natural facilities, for developing which a judicious application of science might do much. There are points in which I consider it has advantages. And the very strong opinions in its favour which have been given by Mr. Assheton Smith, and other gentlemen well acquainted with the coast, are entitled to consideration. The holding ground towards the east end of the bay is stated by Lieutenant Sheringham, confirmed by Commander Tudor and other evidence, to be good (sand over clay). There is good granite in a cliff about two miles to the eastward of the harbour, and other stone equally convenient. The harbour may be said to extend from Porth-dyn-llaen Point on the west, to Point Nevin on the east, this length being 1½ mile; the deep water and shelter are near the "Rock," which is a high narrow promontory or tongue, protruding about three-quarters of a mile from the line of the shore, and forming a natural breakwater on the west; while the east side of Caernarvon Bay, distant about four to five leagues, affords some shelter from easterly winds, and confines within a narrow compass the fetch of the seas in that direction. Excepting with gales between north-north-west and north-east, there is shelter in the harbour for vessels of light burthen, but the part so sheltered is very limited, being only close under the Rock, where the depth is small. For some distance to the eastward, the shore is a long slope of clay or sand, from which there is a better chance of vessels that may be driven ashore being got off without being wrecked or seriously damaged, than at Holyhead, where rock prevails. That the northerly seas are much spent upon the long sloping sandy shore is proved by some dwellings being erected between the sand-hills (the foot of which is washed by extreme tides) and the water; a rough wall in front is their only protection, although their floors are but very few feet above high water, and some of these, with the doors facing the north, have stood unhurt for many years.

In its present state there is nothing to recommend Porth-dyn-llaen as a station for packets. Everything would have to be done; and it cannot be denied that the elevation of the surrounding sand-hills, which is 80 to 100 feet above high water, close to the sea, would cause considerable labour and expense to make convenient buildings, approaches and communications. An example of this is given in the level at which Mr. Vignoles and Mr. Purdon, the engineers, have proposed to terminate the Porth-dyn-llaen railway near the point, being 70 to 80 feet above the level of the sea at high water. This may be lowered, but the inclination would be increased.

Plans for Porth-dyn-llaen.

Your instructions to me are, to prepare plans for a harbour, for a packet station, and for a refuge harbour at Porth-dyn-llaen, as well as at Holyhead. I have done so, and by enlarging

Lieutenant Sheringham's Chart, have to present a design for a pier and breakwater at Porth-dyn-llaen, drawn to the same scale as that for Holyhead.

	£.
Firstly.—For a packet station, the design proposes to form a pier from the east angle of Porth-dyn-llaen Point to Carreg-y-chwislan (lettered A. B. on design No. 2.), a length of about 300 yards, in an east-by-south direction, which is terminated by a return jetty upon Carreg-y-chwislan. This would give good length for steamers; the depth inside it is ample. The width of the quay or pier, exclusive of parapet, is shown to be 50 feet. I have supposed a quay wall at the west end of the pier to be requisite for the purpose of giving between it and the Rock a site for buildings and other conveniences necessary in connexion with the packets. This is drawn to go southward from the west end of the harbour wall, at A. on the plan, and to extend to D., a length of nearly 200 yards. The amount of the works I have described to form this packet station is estimated at -	120,000
Secondly.—A harbour of refuge is supposed to be obtained by forming a sloping breakwater (from B. to C. on the plan) 600 yards in continuation of the pier. The area sheltered from the worst winds, and of which no part would have less than 12 feet water at low water, is about 100 acres, which from the apparent facility of procuring stone* might be executed for about - - - - - - - - - - - - - -	90,000
Thus the engineering works for the packet harbour and refuge harbour would be - - - - - - - - - - - - - -	210,000

exclusive of all other buildings and accommodation, the expense of which would raise the total cost above that for all the works I have designed for Holyhead, and then Porth-dyn-llaen would be more contracted in quay room, and inferior in other conveniences, but would have a larger deep-water harbour.

To detail the advantages and disadvantages of Porth-dyn-llaen for a packet station, would be, as in the case of Holyhead, to repeat a great part of the observations of others. I do not pretend to criticize the nautical opinions, but I beg to remark that Sir James Gordon's and Captain Beechey's illustrations and inferences on the generally injurious effect of the tides in making the crossing from Porth-dyn-llaen as compared with Holyhead, are very plain, and to me, convincing. There are cases when they will not apply, and when Porth-dyn-llaen would have the advantage, as in the case of starting from Holyhead at the first of a flood tide during heavy south-westerly, which are the prevailing winds, when the steamer must stem the tide and be nearly in the teeth of the gale; while a packet leaving Porth-dyn-llaen at the same time might keep under the land out of the bay towards Bardsey, when the south-west would afterwards be a fair wind across the channel, and here the Porth-dyn-llaen passage would be the best; but the average cases, and the circumstances attending the passage in both directions being considered, I think the general conclusion, even without that most powerful of all arguments, experience, is decidedly in favour of Holyhead. Porth-dyn-llaen harbour being in Caernarvon Bay, must always be an objection, from the great risk of not getting out to sea in a northerly gale in case of missing the harbour. The most zealous advocate of Porth-dyn-llaen would, I think, recommend keeping out of Caernavon Bay, if possible, when the gale is northerly, particularly in thick weather, unless he were sure of making a harbour.

Mr. A. Smith recommends a floating light at the mouth of Caernavon Bay, as Bardsey light is 14 miles distant on the south, and the South Stack 18 miles on the north; but even then the passage would be much worse lighted than that to Holyhead, and there would be the liability to a floating light being driven from its position by severe storms, when it is most required.

The relative positions of Holyhead and Porth-dyn-llaen harbours, and the adjacent coast lighthouses, are shown on drawing No. 3. The advocates for Porth-dyn-llaen place in the fore-ground the objection that Holyhead is often in fog, and point to the excellent land-mark afforded by the "Rivals," and other high ground in the bay. The reply from the other side is, that there is deep water to the foot of the "Head," which is often clear when the summit is in a fog; that it is the land-mark which is of all others best known, which a seaman coming into the channel generally attempts to make; that the "Rivals" in Caernavon Bay are not to be seen in foggy and thick weather until approaching them, when, if a mistake has been made, it is difficult to correct it; and that the "Rivals" at the bottom of the bay are by no means equal to the Head at the projecting point, as a land-mark.

That fogs are prevalent off Holyhead is proved by the expedients adopted. An occasional lower light is exhibited at the South Stack when the upper light is obscured, and in addition to the light at the pier, a gun, a bell and other means are used for guiding the packets to the entrance of Holyhead harbour in thick weather. My conclusion is, that the top of the Head is as frequently or even more frequently, in fog, than the top of the "Rivals," but that the peculiar form and features of the South Stack in front of the Head gives Holyhead the advantage. And, on the whole, I think that Holyhead, by day and by night, is now better marked and beaconed than Porth-dyn-llaen can be.

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* I have not supposed any stone to be taken from the Porth-dyn-llaen point, which it would be injudicious to do.

Commander Tudor considers the uniform depth of soundings near Holyhead to be a practical difficulty which would not be experienced in making Porth-dyn-llaen, where the gradual decrease of depth would, be considers, always indicate the position, and, so far as soundings go, I take this to be correct, although the commanders of the steamers state they have no difficulty in making Holyhead by sounding. Their great experience may have overcome the natural difficulty.

On referring to the objections to Holyhead, it may be noticed that they chiefly apply to the harbour as it is. Now, if the measures I have proposed would remedy these defects, which I think they would do, and render it nearly a perfect packet station and harbour of refuge, it is in this improved state that it should be compared with Porth-dyn-llaen in its improved state; for in a national question of this kind, the true policy I take to be to select what is capable of being made the best, and, if there has been an error in hitherto using Holyhead, to proceed no further, but at once to adopt Porth-dyn-llaen. After, however, doing the best in my power in planning for both places, and supposing the land facilities equal, I have been unable to discover any thing like sufficient grounds for preferring improved Porth-dyn-llaen to improved Holyhead for a packet station. I should say this if the sea distance were equal, which is not the case, Holyhead being nearer by six geographical or seven statute miles. Sir J. Gordon and Capt. Beechey state the virtual difference in making the passage, owing to the influence of the tides and to clear the Kish Sand, as several miles greater than the actual difference; and on the average of cases the fact will, as I have said before, be so.

If, then, Holyhead be the better station, independently of the town, the pier, the dock, the Government yard, and the present land communications,—all these come in to add to the weight of the arguments in its favour,—I do not think it possible to have at Porth-dyn-llaen so convenient a site for a dock-yard establishment, as I have shown upon the plan on the west side of the proposed new harbour at Holyhead. For these purposes, also, the nearer distance of Holyhead to Liverpool by sea, for the conveyance of materials, is a consideration.

Notwithstanding all this, a harbour at Porth-dyn-llaen, on the plan I have proposed, would be found very useful as a harbour of refuge for wind-bound vessels, or ships in distress, driven into or near Caernarvon Bay, or going to Caernarvon or to the Menai Straits for cargo, and waiting to cross the bar. The fact of a vessel being in greater danger when in Caernarvon Bay than when off Holyhead makes a harbour of refuge for ships, that may be embayed, the more necessary. Such snug retreats for trading vessels (if refuge be the only object) are not, however, so much desired by the ship-owners as might, at first sight, be expected; their great object, if the vessel be insured, being to make quick voyage, and therefore they prefer their vessels being kept out at sea, even at a little risk. I beg to refer to Lieutenant Sheringham's report of 1838, on the subject of a refuge harbour here. If the harbour were intended for this purpose only, a considerable saving might be made in the cost of construction, as a great portion, if not the whole, of the upright wall might be dispensed with.

I do not apprehend much danger of sand from Caernarvon Bar finding its way to Porth-dyn-llaen, and silting up the harbour, the distance being considerable (12 miles), and the direction of the tidal current from the straits out of the bay, being so far to the northward of Porth-dyn-llaen. The foot of the sandhills would have to be secured, as Sir James Gordon and Captain Beechey have proposed; this could be done at a small expense, so that little or no sand would wash from them in future; but as the fine sand which now covers nearly the whole of the bay must be stirred up by heavy seas, and driven from the cliffs and the shore by strong winds, a portion of it will get into the harbour, and tend to shoal it, though not to any considerable extent. If the idea of a packet station be abandoned, there would be less occasion for stopping the tidal current by connecting the breakwater with the mainland. In this case, however, the design would require consideration.

Railways. I have now to comply with the part of your instructions that has reference to the communication by railway from the two harbours, and, as I have already stated, this branch must be imperfect, from my not having yet received any plans of an inland or south line. To the coast line I have given considerable attention. Mr. Stephenson and Mr. Giles have each proposed a line from Chester to Holyhead, and each has been reported on in detail by Sir F. Smith and Professor Barlow. I have marked upon the Ordnance sheets which will be delivered with this report, Mr. Stephenson's line by yellow, and Mr. Giles' by red lines. Nearly the same line was suggested, and is described by Mr. Vignoles in his report of November 1837, to the Commissioners for inquiring into the subject of railways in Ireland.

Both lines, after leaving Chester, follow the west shore of the estuary of the Dee, through Flint, pass under Holywell to Mostyn Quay, go round inside the point of Air, thence straight to the south of Rhyl, and continue along the coast until within a few miles of Conway, when they proceed to the south side of Conway; after passing which, they again approach the coast, and continue along it to near Penrhyn Park, which they leave on the north or sea-side, and proceed through or near Bangor to the present Menai Bridge; after crossing which, they leave the turnpike-road to get to the low ground on the south side of Anglesea, the greatest distance from the road being at 2 miles west of Mona, where they are 3½ miles to the south. From this point they again approach gradually the turnpike-road near Holyhead.

My decided opinion of the railway, as of the harbour, is that the best line should be selected, and that the railway should be made in a good manner as a great public work.

I believe that the cheapest way might be to do the work well, even if the traffic expected upon it were for some time small; but I think the traffic upon this line will be great and increasing; indeed, that for all but the lowest class of passengers, it will be the general mode of conveyance from all parts of Ireland to England. The north of Ireland is the most out of its influence, and yet five hours between Belfast and London will be saved by going by the railway from Belfast to Dublin when completed, crossing to Holyhead, and then taking the railway to London. The case for the south and west of Ireland would, of course, be still stronger. Then there is the trade of passengers and goods to and from Holyhead, should the harbour be extended and used as I have referred to. It is a mistake, therefore, to suppose, that carrying the mails will be the principal business, or that the mail trains will be the only trains. The Holyhead and Chester line, if this be the line finally adopted, may, when it has attained the same maturity, be nearly as good a line for trade as some of the lines which it will join now are; and that it will be at once a valuable tributary to all of them, cannot be doubted. I name the above, from seeing in Mr. Bidder's evidence on Mr. Stephenson's plan, that there has been a proposal of having only one line, with passing places; an expedient which may have a saving in the first cost to recommend it, but which the danger, the difficulty of repairing, the uncertainty, and the delay, ought much to outweigh. Also, in place of the very circuitous lines which have been proposed at Bangor, and the Menai Straits, and drawing the trains by horses, or by a fixed engine, up the slope and along the present bridge, which was built, and should be kept for the turnpike-road, I think the line should be continued direct to the Straits, and the Straits crossed by an arched bridge built for the railway. The unfitness for a railway, of the present suspension-bridge, which is approached by a slope of 1 in 25; the interference by engines and trains with the present use of it, which interference will, I am sure, be more frequent and annoying than appears to have been contemplated; the delay at all times, and particularly in stormy weather; the having to cross Bangor with an embankment 70 feet in the deepest part; the numerous curves to reach the bridge, and the repetition of similar curves on the Anglesea side, are all objectionable. I think neither the Holyhead road, nor the Menai Bridge, should be injuriously interfered with. The district, and the traveller who does not wish to go at railway speed, ought not to be deprived of the facilities they have had upon the turnpike-roads, which the change of fashion may make more used than they are at present, besides being some check upon tendency to monopoly and its effects. I have shown the circuitous line, and the more direct line recommended by me upon the accompanying plan (No. 4). The railway bridge may cross at the Swelly or Gorred Goch rocks. The position and width of the latter are taken from a survey by Mr. Vignoles; they are nearest the direct line. The late Mr. Rennie and Mr. Telford both proposed fixed bridges over the Straits; the cost was, I believe, the objection. The iron work of bridges may be done now at half the cost, and the traffic will be very much greater than was then calculated upon.

I think Mr. Stephenson's plan* of terminating on the west, better than that of Mr. Giles, which takes the east side of Holyhead harbour.

Mr. Giles' plan of leaving the Chester and Crewe line before reaching the city of Chester, is much to be preferred to Mr. Stephenson's, which passes to the west of the city, and turns back through it by curves and works of considerable difficulty. These, if not objectionable to the citizens, are of an expensive nature. The distance from Holyhead to London, and to all the principal towns, excepting Liverpool, is one mile shorter by Mr. Giles' than by Mr. Stephenson's plan here; and of all places, Liverpool is, from having the direct sea communication to Dublin, least interested in the question. By Mr. Giles' line there is one mile less of railway to make here. The accompanying plan (No. 5.) shows the directions of the two lines near Chester.

Short tunnels through the points of Penman Back and Penman Mawr will, in my opinion, be preferable in respect of despatch and safety, to embanking outside the perpendicular cliffs, which are heavily struck by the seas.

The gradients for both lines are unobjectionable. A very detailed and clear account of each line is given in Sir F. Smith's and Professor Barlow's report, which contains also a proof of the sufficiency, as a question of statistics, of the chains of the Menai Bridge to carry the railway trains.

Mr. Stephenson's line through Anglesea is not so straight as Mr. Giles', but the difference in cost would, in some places, be greater than the advantage by the straightness; a medium course may be the best. Near the Menai and approaching Holyhead, Mr. Stephenson appears to keep unnecessarily near the road for the safety of travellers upon it.

I avoid troubling you with further details. If the Government be a party to any contract, the line as well as the terms will, no doubt, be settled with due reference to the public in the conveyance of passengers as well as mails.

If the harbour works be done in a good manner at the public expense, the railway to it should correspond; whatever is expended in improving and enlarging the harbour will be beneficial to the railway by increasing the traffic upon it; and if the railway is to be made by a Joint Stock Company, there will, I apprehend, be no difficulty at present in obtaining offers from parties who would be ready, with the aid of a fair compensation for carrying the mails, to undertake the work upon a plan approved by the Government. To have parties who are influential upon the present lines, so that the public convenience may be secured for the whole length, might be an advantage.

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* If there is any inaccuracy in my statement of Mr. Stephenson's line, it must be ascribed in part to my not receiving from him any explanation of his line, beyond what the documents which he had previously sent in afforded me.

Present Railway.

As the survey of the inland line of railway is unfinished, I have not inquired into the working of the Great Western Railway, but I have into that of the London and Birmingham, and I have received every facility and attention in doing so from Mr. Glyn the chairman, Mr. Creed and Mr. Bury, with an expression of readiness to consider liberally any suggestion that might be made. A few which I named, and will now state, were received in this spirit.

Ten minutes are allowed for the first mile from Euston-square, on account of the stationary engine work; this is at the rate of 6 miles per hour; it may be done and often is done in less time, but the difference is lost at the first stoppage, as the train must wait its time there. Now it is agreed that the locomotive engine might go to the terminus and start at once. This would save five to seven minutes.

In two hours after starting there is a stoppage of ten minutes at Wolverton, where refreshments are supplied and invitingly served; less than half the time would do for changing the engine. There is no similar stoppage between Liverpool and Birmingham, although Birmingham is nearly equidistant from London and Liverpool.

The arrangements near Birmingham are still more unnecessary and more tedious. Here the up and down trains are taken off the direct course to the Birmingham station, to a point which obliges the carriages to be turned round upon turn-plates; half an hour is usually allowed for this and for refreshments. These operations being finished, the train returns along a curve upon the Grand Junction Railway to the valley of the Tame. In addition to the stoppage, we have 2⅓ miles of unnecessary travelling, the straight line or base of the triangle being 2½ miles, the two sides which are travelled 4⅚ miles. I see no reason, except the "good of the houses," why the mail, or a traveller to Liverpool or Dublin, should be kept ten minutes at Wolverton, and then be carried two miles out of his way in two hours afterwards, to be refreshed for half an hour at Birmingham.* Delicate persons, requiring frequent and long stoppages, will have the opportunity of travelling by other than the mail-trains. Between eight o'clock P.M., when the mail coaches upon the road leave London, and the same hour next morning, no time is allowed but for changing horses. If a few minutes be taken at some one place, it has to be made up for on the road. This may be the other extreme, and insufficient; it is worse than having no stoppage, exceeding five minutes, between London and Holyhead. Even Birmingham, for the sake of conciliating which, the Birmingham detour was made at the time, will, I think, agree, that its convenience would be answered by having the Birmingham carriages to detach from the train. The accompanying Plan (No. 6) illustrates my remarks on the Birmingham detour. In justice to the Railway Companies themselves, and to such of their passengers as are desirous of "getting on," the cut ought to be made now. The Companies can afford it; I have had it surveyed. The execution would not be expensive, considering its importance. There are no buildings in the way.

By the above and the alterations lower down, to which I have referred, the worst curves between London and Holyhead will be avoided, and the distance reduced nearly five miles.†

Then as to speed.

The London and Birmingham Company began, very prudently, at 18 miles per hour; the work was new to them; they rose to 20; then 22½; the last return of their mail trains was 26⅓. With the exception of their power being occasionally too small for their loads to ensure punctuality, their work has been regularly, safely and creditably done, so far as I have observed or heard, and has progressed steadily; their concern has paid well, and they appear disposed to attend to what the public convenience requires of them. The present Great Western speed is 29. These include stoppages.

There is, in my opinion, nothing in the difference of gauge of the two railways to prevent the Birmingham and Grand Junction being as quick as the Great Western, if they would apply sufficient power. That the Directors think so, is evident, from their allowing a speed of 40 miles per hour to be run when the inclination is in favour. The Northern and Eastern return is 36 miles as their speed, exclusive of stoppages. My observations upon this railway, and part of the Brighton, and also the South Eastern, make the speed vary from 36 to 40, and occasionally 42. The Great Western is often 45; on special occasions it is still more.

The following calculations of time and speed are meant to refer to the mail and fast trains only. I propose to show, that, after the extension and improvements to which I have referred are made, the journey between London and Dublin may generally be made in 14 hours, and that the answers to letters posted in the evening may be received by the morning delivery, after one day's interval.

By the received measurements of the present railways, and of the Ordnance map from Chester to Holyhead, the distance between London and Holyhead, allowing for the straightening at Birmingham and other places, will be 267 miles, which, at 36 miles per hour, is

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* There is no post-office arrangement requiring so great a delay.

† The line that was projected from Stone to Rugby would save seven miles, by making 60 miles railroad.

	h.	m.
hour, is	7	25
Add for one stoppage of 15′, two of 10′, two of 5′, and five of 4′	1	5
Makes between London and Holyhead stations, or 31 7/17 miles per hour, including stoppages	8	30
Allow for crossing to Kingstown and reaching the Dublin Post Office	5	30
Is from Euston station to Post Office, Dublin	14	–
Allow time in Dublin	5	–
Journey back to Euston Square	14	–
Making the journey from Euston Square to Dublin, and back to Euston Square	33	–

According to this, if the train leave the Euston station at 8 h. 30 m.* P.M., the present time for departure,
The mail would be in Dublin Post Office at 10 30 on the following morning.
It would leave at 3 30 in the afternoon,
And arrive at Euston at 5 30 next morning, being the present time for arrival there.

Some modification may be required in the above detail, but a very small allowance upon the present speed is required to justify the conclusion as being practicable. Whether the Great Western course will produce something still superior, remains to be shown when I have the materials for making the calculations; but to have taken the Birmingham and Grand Junction lines, without including the improvements of which they are capable, would have been unfair, as I think the Birmingham and Grand Junction Companies will see it to be their interest to make these improvements, because, without them, the above results for the time of the mails between London and Dublin could not have been brought out.

Bangor to Porth-dyn-llaen.

I named having inspected the country between Bangor and Porth-dyn-llaen, which has been surveyed by Mr. Vignoles and Mr. Purdon for a railway. A higher level near Penrhyn Castle must be kept to accommodate this line; but, after getting through the hill above Bangor, which, according to my opinion, the Holyhead as well as the Porth-dyn-llaen line should encounter, there is no difficult feature for a great length. The line keeps within a short distance of the turnpike-road which skirts the Menai Straits and Caernarvon Bay, except near Caernarvon, which it passes 1½ mile east of the town.

The country is favourable, very much more so indeed than its vicinity to mountains would have led me to expect. The only difficulty of a formidable nature is the Rival mountain, which the engineers manage by keeping close to the shore, where the mountain is so narrow, that only two short tunnels, together one mile in length, are required. There is also a deep and difficult cutting west of the Rivals, two-thirds of a mile long, through rock. The greatest inclination is 1 in 400.

The length from Bangor to Porth-dyn-llaen is four miles greater than to Holyhead, but of the two, I consider that to Porth-dyn-llaen the easier; and if an inland line to Holyhead, whether through Worcester or Shrewsbury, can be shown, which shall be as good as by far the greater portion of the Bangor to Porth-dyn-llaen line, it will be superior to the coast line, which has some heavy work in parts, and which, in some places upon the coast, will be much exposed to storms.

I have the honour to be, Sir,
Your most obedient and very humble Servant,

23, Great George Street,
October 6, 1843.

(signed) *James Walker.*

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[*] All Greenwich time. Dublin time is 25′ 22″ later. Much confusion and disappointment would be prevented by the clocks in the United Kingdom being all kept to Greenwich time; the true time for astronomical purposes might also be shown upon the dial.

APPENDIX to Mr. WALKER'S REPORT.

COPY of LETTERS referred to in Mr. *Walker*'s REPORT, from the Officers commanding the Government Steam Packets, and from the Commanders of the Company's Packets running between *Liverpool* and *Kingstown*.

John P. Philipps, Lieutenant, commanding Her Majesty's Packet "Medusa," to Commander *Bevis*, R. N.

Sir, Liverpool, 23 June 1843.

IN reply to your letter of yesterday, I beg leave to state, that I do not feel competent to judge of the merits of the harbours of Holyhead and Porth-dyn-llaen for a packet station, never having seen the latter, except on the chart, from which, however, I am led to imagine that Porth-dyn-llaen would be exempt from the strong tides and heavy sea of the race of Holyhead; as to the land-fall, there does not appear to me to be a better than Holyhead on the coast of Wales; the difference of distance in crossing the Irish banks would be very trifling.

I am, &c.

G. Keane, Lieutenant, commanding Her Majesty's Steam Packet "Merlin," to Commander *Bevis*, R. N.

Sir, Liverpool, 24 June 1848.

IN reply to your letter of the 22d instant, I beg to state, for the information of my Lords Commissioners of the Admiralty, that I am not in any way acquainted with the harbour of Porth-dyn-llaen. But from having several times crossed the Bay of Caernarvon, I have at all times found a great indraft. I consider a bay at all times objectionable, and particularly a very shallow one, such as Caernarvon Bay is, when put in comparison with making a bold head-land.

Caernarvon Bay is open to the most prevalent winds that blow in this channel during the winter season (from south-west to north), the severest gales generally blow from west-south-west to north-west, which are smooth water winds in Holyhead harbour. Also, when approaching the Irish coast with a heavy south-east gale, which is most generally accompanied with thick weather, there would be great danger unless the course steered was sufficiently to the northward to enable you to go round the Kish light-vessel, and make Houth, thereby very considerably increasing the distance.

I am, &c.

William Smithett, Master, commanding Her Majesty's Packet "Medina," to Commander *Bevis*, R. N.

Sir, Liverpool, 24 June 1843.

IN reply to your letter of the 22d instant, calling for my opinion as to the comparative advantages possessed by Holyhead and Porth-dyn-llaen as a packet station for communication with Dublin,—

I beg respectfully to state, for the information of my Lords Commissioners of the Admiralty, that I have never been at Porth-dyn-llaen, consequently have had no opportunity of forming a correct idea as to the eligibility of that place compared with Holyhead.

Looking at the two places on the chart, considering the tides, the banks on the Irish side, the land gales, and the prevailing westerly winds and hazy weather, I consider Holyhead to be decidedly the safest and most suitable port.

I am, &c.

D. Tanfield, Lieutenant R. N., of "Princess" Royal Mail Contract Packet, to Commander *Bevis*, R. N.

Sir, Liverpool, 28 June 1843.

IN reply to your letter of the 22d instant, requesting my opinion, for the information of the Lords Commissioners of the Admiralty, as to the comparative advantages or disadvantages of Holyhead and Porth-dyn-llaen as a packet station, to communicate with Dublin, I beg to state that my opinion is decidedly in favour of Holyhead, both for safety and dispatch.

1. As regards the tides, I do not consider they would make much difference in favour of either port.

2. As to the Irish banks, I look on them as a complete barrier to Porth-dyn-llaen, for in thick hazy weather (of which there is so much in this channel), it would be necessary to make Houth when bound to Kingstown, as those banks are steep too, and the sounding so irregular as to make them extremely dangerous to run for, and by hauling so far to the northward as Houth you increase the distance; and as most commanders are anxious to make their passage as quick as possible, they would often be led to run the risk of making the banks, and might sometimes get their vessels into danger; besides, they must approach them so cautiously, that, by stopping so often to sound, a deal of time would be lost.

3. As to the land-fall on the Welsh side, I should prefer making Holyhead to running into a deep bay after crossing a strong tide, which must always make the course uncertain.

I am, &c.

Walsingham Bealgley, of Her Majesty's Contract Steam Packet "Queen Victoria," to Commander *Bevis*, R. N.

Sir,

Liverpool, 29 June 1843.

In reply to your letter of the 22d ultimo, wishing to know my opinion as to the comparative advantages of Holyhead and Porth-dyn-llaen as a packet station for communication with Dublin, I beg to say, I think there is no comparison whatever, inasmuch as the former is fully seven or eight miles nearer to the Kish light-ship, and the course from thence much more to be depended upon, especially in thick weather.

With a north-west gale from Porth-dyn-llaen, outward bound, owing to the long fetch of a heavy sea, and in a deep bay, considerable delay would be the consequence. Then, again, with the wind at south-east, in thick weather, bound to Dublin, so much allowance would be made to avoid the banks on the Irish coast, from the uncertainty of the soundings, that vessels in general would get to the northward of the bay. With respect to the land-fall, having not been at Porth-dyn-llaen, I cannot say, but should suppose there can be but little difference. I certainly think there is less tide, and the soundings more correct, off Porth-dyn-llaen; but still, in point of risk, I would much rather command a steamer from Holyhead to Dublin.

John Williams, of "Prince" Steamer, to Commander *Bevis*, R. N.

Sir,

Liverpool, 28 June 1843.

In answer to your request, as regards my opinion of Holyhead and Porth-dyn-llaen as harbours for Her Majesty's steamers appointed to convey the mails to and from Kingstown, I beg to state, that I consider the former by far the safest and best. In the first place, Holyhead is a shorter distance, and a straight course can be made from it direct into Kingstown harbour; and in steering to Holyhead there is a fine bold coast under your lee to run down upon in thick foggy weather, or in the event of your steamer being disabled in her machinery.

The tides are also better between Holyhead and Kingstown than they are between the latter harbour and Porth-dyn-llaen, as in the former case a steamer crosses them at right angles, but in the latter she would have to bow them, which affects her true course considerably.

From Porth-dyn-llaen to Kingstown a steamer has to avoid, when making a straight course, the dangerous banks which lie direct in her track, and which are unusually dangerous, because of their steep edges; to avoid them the course has to be changed, whether a commander runs through Wicklow Swash or round the north edge of the Kish, and, of course, in going from Kingstown, the same angles and changes of the course must be made, which tend to confuse seamen in thick hazy weather. On approaching Porth-dyn-llaen in north-west or strong westerly gales, and in hazy weather, there is great danger of being embayed in Caernarvon Bay, and, as you have in that case no harbour under your lee, much risk must be the consequence.

In conclusion, I have to state, that I have had 19 years' experience as a commander of steamers from Liverpool to ports in the Irish Channel, and my practical knowledge teaches me that Holyhead is by far the safest of the two ports.

I am, &c.

SUBSTANCE of Opinion given by Mr. *Robert Thomas* to Mr. *M'Clean*, Mr. *Walker*'s Assistant.

Liverpool, 4 September 1843.

Is a native of Wales; at present commander of the "Benledi" steam-boat; formerly of the steam-boats "Snowdon" and "St. Mungo," down to Porth-dyn-llaen, also of the "St. Winifred," the "Countess of Glasgow," and "Vale of Clywd;" was master of the sailing vessel "Constantia," trading from the River Dee to Beaumaris, Caernarvon, Bristol and Ireland; has (besides an apprenticeship of four years) been 18 years along the coast; was previously three years in the "Tribune," R. N., 15 months in the Revenue service, and in foreign trade 11 years; is not interested in either harbour; as a Welshman, would be partial to Porth-dyn-llaen.

Considers Holyhead at present capable of accommodating steam-vessels of the largest size at present trading between Liverpool and Dublin, to a limited extent; that if the outer harbour were improved, by extending the present piers, and carrying out a breakwater in a north-east direction, would be suitable for vessels of any size yet built, and would accommodate any number.

As a harbour of refuge, these improvements would make it capable of receiving vessels coming from any part, at any time of tide and with any wind.

Has been there in several gales, and does not recollect an accident having occurred.

Porth-dyn-llaen is at present little better than an open bay, not capable of accommodating steamers of the smallest size; the passengers and cargo must generally be landed from boats at great risk, owing to the swell. The anchorage is good, but the vessel must be moored far out in the bay on account of the heavy surf and shallow water, and even then in high winds is in great danger of parting her chain; was obliged to keep the steam up in a 94-ton steam-boat to prevent her being driven ashore during a gale with an anchor down. The "Vale of Clywd" steam-boat was driven ashore three or four years ago, and the "St. Catharine" on the rocks in the inner harbour, and afterwards wrecked near Nevin Head. Sailing vessels during a gale are obliged to slip their anchors and beach, which occasions much damage from bilging.

To make it suitable for steam-vessels of the largest size, and for a harbour of refuge, Porth-dyn-llaen Head should be carried out as far as the Carreg-y-obwislan Rock, and thence south-east for a considerable distance, to shelter it from the north-north-east wind, the prevailing one in that part. The old pier should be removed, the rocks in the inner harbour blasted, and the sandy bay deepened. Even then, for the present trade, he would prefer Holyhead.

SUBSTANCE of Opinion given by Mr. *Thomas Thomas* to Mr. *Walker*.

London, 2 October 1843.

MR. THOMAS THOMAS is a native of Tydweilcog, a village three miles from Porth-dyn-llaen, and five miles from Nevin. Served his apprenticeship on board a coaster, and continued in the coasting trade several years; traded for three years between Liverpool and the West Indies; served three years on board Mr. Assheton Smith's steam-yacht the "Menai;" was two years sailing-master, and one year master of the "Vale of Clywd" steamer, and two years master of the "Snowdon" steamer, both trading in the winter between Porth-dyn-llaen and Liverpool with cattle, and in the summer between Beaumaris and Caernarvon and Liverpool with passengers, one summer trading between Caernarvon and Aberstwyth and Dublin.

Is now master and partly owner of the "Josephine" schooner carrying slate to London.

Is not at all interested in Holyhead or Porth-dyn-llaen; his parents still reside at his native place, but he has lived ten years at Caernarvon.

Knew Holyhead before the pier was carried out, and often makes use of the harbour in bad weather. Considers the harbour safe when in it; it answers as a steam-packet harbour much better than for sailing vessels, and it is a most dangerous place for vessels in distress, from having no good beach to leeward; there is nothing but rough steep rocks to run upon. He would rather be embayed in Caernarvon Bay than in Holyhead Bay, because there is more space to work in, and fewer dangers.

If there is any good holding-ground in the bay, the sea is so heavy that a vessel might as well lay-to in the Bay of Biscay as there in a gale.

In approaching Holyhead harbour in thick weather, you cannot ascertain your position from sounding; the depth of water is very uniform, and does not decrease by degrees, but all at once, and you scarcely find the water get shallower before the vessel is ashore. The strong race of tide adds to the difficulty, and from this cause he has been informed the sailing packets used often to lose their passage.

The strength of tide is very great off Holyhead with an ebb-tide and a strong south-west wind, or with a flood-tide; when it is blowing strong from the north-east, there is a very dangerous sea.

Can remember a steam-packet putting back after leaving Holyhead in bad weather; this may have occurred ten years ago; and sailing vessels have been sent with the mails in place of the steamers.

If there is any fog in the channel, Holyhead is sure to catch it, and it is more frequently foggy than clear in the Head. The South Stack is not very high, and can be seen when half the Head is covered. The lower light there may often be seen when the upper one is obscured by the fog.

A vessel in a disabled state approaching the harbour in a gale from north-west, if she is unable to "hug" the weather shore, has nothing but destruction before her; by the time the anchor is let go and the vessel has scope, she is ashore on the rocks. A vessel having plenty of canvas may get in.

When the wind is strong from the south-west and south-south-west, vessels cannot beat into Holyhead harbour from want of space.

He has never commanded a vessel from Holyhead. Was once in thick weather embayed in Holyhead Bay, and not being able to clear out, got safe into the harbour. At another time, when the wind was easterly, being deeply laden with pigs for Liverpool, he was obliged to put into Holyhead.

A great many make use of the harbour under similar circumstances, but not if they can help it, and would much rather bear up for Liverpool, or, in going southwards, make for St. Tudwall's Roads.

Considers that a good harbour might be made at a great expense; but that it would not be so well placed as at Porth-dyn-llaen.

Porth-dyn-llaen, in its present natural state, is often run for by vessels in distress; if it were better known, and described in the sailing directions, it would be much resorted to, as it is a good place to save life and property. Vessels are embayed in Caernarvon Bay, and can find no shelter in gales from north-west; on an average six to eight, and most of them foreign vessels, are wrecked every year. For the benefit of merchant ships in general, a harbour at Porth-dyn-llaen would, in his opinion, be far preferable to one at Holyhead. For vessels going from Caernarvon to Ireland, or down channel, Porth-dyn-llaen is a good place to bring to at, either on a dark night, or with a contrary wind. It very rarely happens but some vessels are lying there.

Does not consider that every vessel would be safe in Porth-dyn-llaen as it now is, for all are not equally provided; but any vessel, whether large or small, having good ground-tackle, will hold on through the worst of gales in the roads.

Should the tackle not be sufficiently strong, and it become necessary to beach the vessel, the beach is so clean that this may be done without injury.

He has known many persons who were afraid of their ground-tackles not being strong enough, run their vessels aground, instead of bringing them to.

A steamer being longer than a sailing vessel, would ride comfortably here in all weathers.

He would not mind riding in Porth-dyn-llaen in his own vessel, with her present tacklings, all the year round, and in a north-west gale would prefer taking a square-rigged vessel here to Holyhead.

The holding-ground is good; there is clay 15 fathoms inside Carreg-y-chwislan, keeping the sound open north-west by-north; towards the shore there is more sand.

Is of opinion that Porth-dyn-llaen is better situated naturally, and more easily found in thick weather than Holyhead, and that it is a better passage to make in bad weather from Porth-dyn-llaen to Kingstown than from Holyhead.

In thick weather, although the tops of the Rivel mountains are obscured, the foot of them may be seen much further than the South Stack can be. He always found a fog thicker on a headland than in a deep bay.

A vessel running up channel on a dark night, and not being able to see the South Stack light, on approaching Anglesea, and getting out of the main stream of the tide, is driven by the ebb tide into the bay towards Caernarvon Bar, where the land is so low that the vessel is driven ashore before those on board are aware of their being near land. He has seen six vessels ashore in one night, some north of Caernarvon Bar and some on the Bar. Eleven vessels ran ashore the same winter. Caernarvon Bar has three fathoms over it at high water, and two fathoms at low water, neap tides.

In approaching Porth-dyn-llaen from Kingstown, the soundings between Bardsey Island and the Rivels diminish so gradually, that the position of a vessel may always be known; about 18 miles from Porth-dyn-llaen the depth is 60 to 65 fathoms; at 15 miles, 30 fathoms, and then decreases gradually to 6 or 7 fathoms, which is close in shore.

Taking the average of weather, he thinks a vessel will make Porth-dyn-llaen sooner than Holyhead, for the wind two-thirds of the year is from the south-west. With this wind and the first of the flood, a vessel from Holyhead to Kingstown has to stem both wind and tide; but from Porth-dyn-llaen, by keeping along the shore in smooth water as far as Bardsey, which is 35 miles to windward of Holyhead, a vessel has the wind abaft her beam all the way to Kingstown, and would make the passage three hours sooner, and in all cases in crossing from Porth-dyn-llaen you have only the regular tide to contend with, but from Holyhead the race of tide is very much stronger. In getting out of the harbour with a head wind, Porth-dyn-llaen is far preferable to Holyhead, because at Porth-dyn-llaen there is plenty of room to make a tack.

If a pier were carried out from Porth-dyn-llaen Point towards Carreg-y-chwislan, leaving a small opening in the sound for vessels to enter the harbour when in a disabled state, and another pier carried from Carreg-y-chwislan in a direction east-south-east for half a mile, Porth-dyn-llaen would then be a much better harbour for vessels in distress than Holyhead can possibly be made, being so much better situated, and from having greater natural advantages; and even if a pier were only carried as far as Carreg-y-chwislan it would be of great use. He considers Porth-dyn-llaen, as a station for steam-packets and for a fixed communication between England and Ireland, would, with the pier he recommends, be a much better station than Holyhead is at present.

He frequently passes through the Menai Straits, and remembers them very well before the bridge was built; does not think it has affected the passage, nor does he think that any bridge, if built high enough and on dry foundations, would do so. The narrower the strait is made, the stronger will be the draught of wind through it.

LIST OF PLANS appended to MR. WALKER'S REPORT.

1.—*Holyhead Harbour.*—DESIGN for the Extension of the Packet Pier; also for a Breakwater and Harbour of Refuge.

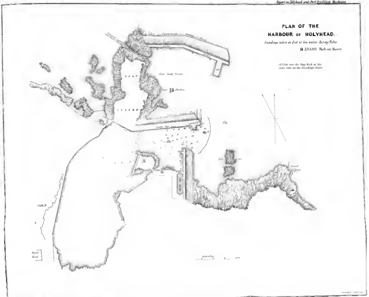
2.—*Porth-dyn-llaen Harbour.*—DESIGN for a Packet Pier and Breakwater.

3.—SKETCH of part of the Coast of *Caernarvonshire* and *Anglesea*, showing the relative positions of *Holyhead* and *Porth-dyn-llaen* Harbours, and of the Lighthouses adjacent thereto.

4.—SKETCH, showing the Lines of Railway at *Bangor*, and across the *Menai Straits*.

5.—SKETCH, showing the Lines of Railway at *Chester*.

6.—SKETCH, showing the proposed Junction of the *London* and *Birmingham* and Grand Junction Railways, near *Birmingham*.



PLAN OF THE HARBOUR OF HOLYHEAD.

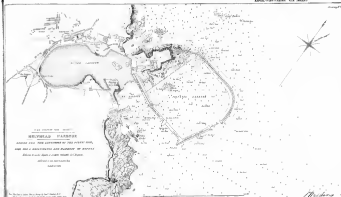
Soundings taken in Feet at low water Spring Tides

H. EVANS Harbour Master

16½ Feet over the Stag Rock at the same time as the Soundings below.

Ordered by the House of Commons to be printed, 15th February 1844.

Drawing No 1



PLAN SHEWING THE DESIGN

HOLYHEAD HARBOUR

DESIGN FOR THE EXTENSION OF THE PACKET PIER,

ALSO FOR A BREAKWATER AND HARBOUR OF REFUGE

Referred to in the Report of JAMES WALKER Civil Engineer.

Addressed to the Lords of the Admiralty

[illegible]

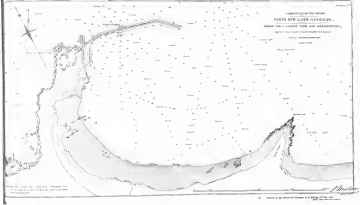
Note. The Plan is taken from a Survey by Captn. [illegible] R.N.
The Soundings are in feet below the depths at low water spring tides.

J Walker

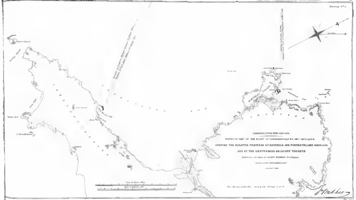
[illegible]

Ordered, by the House of Commons to be Printed, 13th July 1846.

[illegible] Hansard, Printer


COMMUNICATION WITH IRELAND
PORTH DYN LLAEN HARBOUR.
DESIGN FOR A PACKET PIER AND BREAKWATER,
PORTH DYN LLAEN
J. Walker

Ordered by the House of Commons to be Printed, 20th Feb. 1844.



COMMUNICATION WITH IRELAND.

TRACING OF PART OF THE COAST OF CAERNARVONSHIRE AND ANGLESEA

SHEWING THE RELATIVE POSITIONS OF HOLYHEAD AND PORTHDYNLLAEN HARBOURS

AND OF THE LIGHTHOUSES ADJACENT THERETO

Referred to in the Report of JAMES WALKER, Esq. Engineer

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Ordered by the House of Commons to be Printed [illegible]

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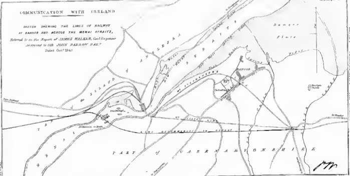
Ordered, by the House of Commons, to be Printed, 19th Feb. 1849.



COMMUNICATION WITH IRELAND

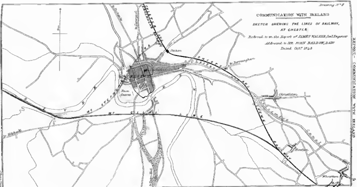
SKETCH SHEWING THE LINES OF RAILWAY
AT BANGOR AND ACROSS THE MENAI STRAITS;
Referred to in the Report of JAMES WALKER, Civil Engineer
Addressed to SIR JOHN BARROW BART.
Dated, Octr. 1848

Drawing No. 8

COMMUNICATION WITH IRELAND

SKETCH SHEWING THE LINES OF RAILWAY, AT CHESTER

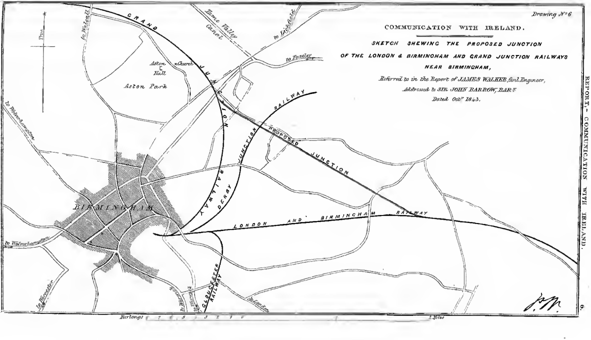
Referred to in the Report of JAMES WALKER, Civil Engineer
Addressed to MR. JOHN BARROW, R.A.N.
Dated Octr. 1843



48 Ordered, by the House of Commons to be Printed, 13th Feby 1844.

James & Luke J. Hansard, Printers

43. Ordered, by the House of Commons to be Printed 15th Feby 1844.



Drawing No 6

COMMUNICATION WITH IRELAND.

SKETCH SHEWING THE PROPOSED JUNCTION
OF THE LONDON & BIRMINGHAM AND GRAND JUNCTION RAILWAYS
NEAR BIRMINGHAM,

Referred to in the Report of JAMES WALKER, Civl Engineer,
Addressed to SIR JOHN BARROW, BARt.
Dated Octr 1843.

509

HOLYHEAD AND PORTDYNLLEAN HARBOURS.

RETURN to an Order of the Honourable The House of Commons,
dated 6 August 1844;—*for*,

COPIES of the REPORTS of Sir JOHN RENNIE and Mr. PAGE, on the HARBOURS of HOLYHEAD and PORTDYNLLEAN.

(*Mr. Darby.*)

Ordered, by The House of Commons, *to be Printed*,
9 *August* 1844.

No. 1.—Sir **John Rennie's** Report on the Harbours of Holyhead and Port Dyllaew; 30th March 1844 - - - - - - - - - - - - p. 3

No. 2.—Report of **Thomas Page**, Esq., Civil Engineer, on the Eligibility of Holyhead and Porth-dyn-Llaen, as Harbours of Refuge and Packet Stations for communicating with Kingstown - - - - - - - - - p. 13

Mr. Page's Plans.

No. 1.—Plan of the Bays of Porth-dyn-Llaen and Nevyn, showing the suggested Breakwater for a Harbour of Refuge.

No. 2.—Plan of Holyhead Bay, showing the suggested Breakwater for a Harbour of Refuge.

No. 3.—Diagram, showing the Direction and Force of the prevailing Winds.

COMMUNICATION WITH IRELAND.

No. 1.

Sir JOHN RENNIE'S REPORT on the HARBOURS of HOLYHEAD and PORT DYLLAEW; 30th March 1844.

To the Committee of Noblemen and Gentlemen interested in obtaining the most perfect Means of Communication between England and Ireland.

My Lords and Gentlemen, London, 30 March 1844.

IN compliance with your request, I have examined the Harbours of Holyhead and Port Dyllaew, for the purpose of giving my opinion as to how far I consider they are capable of improvement, and which of the above two places, under all the different circumstances, I consider best adapted for maintaining the communication between London and Dublin in the most expeditious, safe and certain manner, combining at the same time a refuge-harbour for the trade of the Irish Channel.

The subject is one of such vast importance in every respect, and comprehends so many and such a variety of interests, and has been already investigated by so many able authorities, nautical as well as civil, that it has been almost exhausted.

Still, however, the consequences of a wrong decision are so serious, that it is better to pause even to prolixity, in order that every possible circumstance may be thoroughly considered and investigated before the question be finally and irrevocably decided.

Fully impressed with the importance and difficulty of the question, I have carefully studied the different facts which bear upon the subject, such as the winds, the tides, the currents, the character of the coast, whether as regards its geographical outline or geological formation, the soundings, the anchorage, the bearings and distances, and the cost of construction. I have also perused and studied with much attention the various reports and evidence given before Parliament of the Naval Commissioners, Mr. Walker, and other public and private individuals, and every paper or document which I could find having any bearing upon the subject, and beg leave to communicate the result of my investigation in the following report.

The subject may be divided into three parts:—

First,—The situation and peculiar characteristics of Holyhead and Port Dyllaew, whether as regards their present facilities for packet-stations to communicate with Dublin, or as refuge harbours for the general trade of the Irish Channel.

Secondly,—The plans proposed for their improvement as packet-stations and refuge harbours combined.

Thirdly,—A comparison between Holyhead and Port Dyllaew, as to which, under all the circumstances, possesses the superior advantages, whether as a packet-station or refuge harbour.

HOLYHEAD.

WITH regard to the first, Holyhead Harbour is formed by a small creek, dry at low water, about half a mile long and a quarter of a mile wide, situated on the northern side of the Island of Holyhead, which is separated from the Island of Anglesea by a strait or channel, extremely narrow near the centre, but widening at each end, so as to form the Outer Harbour or Bay of Holyhead on the northern, and Cymmeran Bay on the southern end. The northern, which is the principal, is called the Bay Roadstead or Outer Harbour of Holyhead. This bay is formed by the bold projecting promontories of Mount Carmel on the north, and that of the North Stack, on Holyhead Island, on the south; the distance between them in a direct line being seven miles, and the depth, taken to the mail-road embankment which connects Holyhead Island to Anglesea, is about 4¾ miles. About a mile and a quarter S. W. by S. is situated the small rocky islet called the South Stack, surrounded on all sides by rugged perpendicular cliffs, and separated from the main land by a deep chasm, through which the tide flows; it is crossed by a chain bridge. On the islet there is an excellent revolving light, 200 feet above high-water mark. On the north side of Holyhead Island, there is another small island, called Ynys Halen, or Salt Island, separated from it by a small creek. This island lies in front of the creek before mentioned, and forms a kind of breakwater to the present inner harbour.

The coast is generally low, rising gradually above the level of high-water mark, with the exception of the bold headlands of Mount Carmel, and the North and South Stack islets, which rise abruptly from the sea, in lofty, rugged, perpendicular cliffs, with deep water close to them. Immediately behind the Stacks the Holyhead mountain rises 700 feet perpendicularly, which, from its prominent position and lofty elevation, forms a conspicuous object far and wide in the Irish Channel.

The shores are for the most part extremely irregular and rugged in their outline, being composed of rocks of the chlorite schist formation, interspersed with veins of quartz, mica and serpentine.

From the Harbour of Holyhead to the upper end of the bay, the shores are composed of small rocky bays interspersed with sand, which is brought down from the hills and adjacent coasts.

The soundings, taken in a line between the North Stack and Mount Carmel vary from nine to nineteen fathoms at low water, and decrease from thence to ten fathoms in the centre of the bay, and thence gradually to the upper end. The bottom is rather foul, being composed of sand and rocks. There are also several dangerous rocky shoals in different parts of the bay, which require particular notice; namely, the Stag, bearing nearly E. about 1,600 feet from the present pier-head, upon which there is only fifteen feet at low-water spring-tides; also the Outer Platters, about 1,200 yards N.N.W. from the present pier, upon which there is only two feet at low water. There is a sound between them and the shore; but as foul ground extends some distance from the shore, it should be avoided by strangers; and the Inner Platters, bearing N. about 650 feet from the pier-head with only five feet. Upon the north side there is the Fenwick or Bolivia Shoal, upon which there is only nine feet; it lies about three miles and a quarter N.N.E. of the pier-head, and three-quarters of a mile from the shore. The bay is exposed from W. round by N. to N. by E., or nine points of the compass, and when the wind blows from these points, a heavy and violent swell sets in, which renders it very dangerous for vessels lying at anchor there; indeed, upon such occasions, unless extremely well found, they run the greatest risk of parting and driving upon the rocky shore, when they become wrecks in a short time. Immediately opposite to Mount Carmel, bearing N.W. one mile and a half, lies the Skerries, a small cluster of rocky islands, extending half a mile in an E.N.E. ½ E. direction, and rising considerably above high-water mark. Upon the highest of these there is a fixed light 117 feet above high-water, which may be seen at the distance of sixteen miles. The sound between the Skerries and the shore is about a mile and a half wide, with from eight to seventeen fathoms at low water; but as there are several rocks and shoals in it, such as the East and West Platters, the West Mouse, &c., almost dry at low water, with a strong overfall current on them, strangers should avoid it.

Inner Harbour.

The Inner Harbour of Holyhead is formed by a small creek or bay, half a mile long and 900 to 1,500 feet wide, covering a surface of about 50 acres, dry at low water. On the north side of this creek, and about three miles to the east of the North Stack, lies Ynys Halen, or Salt Island, which is about 1,300 feet long and 1,000 feet wide. At the southern extremity of this island a stone pier has been carried out 1,200 feet in an eastwardly direction, with a jetty projecting 80 feet at right angles to the inner wall or face of the pier, and 100 feet from it. At the extremity of the pier-head there is 12 to 13 feet at low water of spring-tides, which decreases about half way from the pier-head to the low-water mark. Immediately opposite to the east pier jetty there is another pier, 600 feet long, with a circular head, carried out from the opposite shore, leaving an entrance between them of nearly 430 feet wide. Within this pier there is a graving-dock, 250 feet long and 90 feet wide, capable of receiving a small frigate. These piers were designed and constructed under the late Mr. Rennie, at the public expense. It is high water at the full and change of the moon, at 10 hours 25 minutes; ordinary springs rise 17 feet, neaps 9 to 10 feet, and extra or equinoctial springs to 18 and 20 feet; the highest tides generally occur at two days after full and change.

Tides.

The main flood tidal current comes from the southward, and the ebb in the contrary direction. The flood current commences about a mile to the westward of the South Stack, a little before low water at the pier, and sets E. by N., and, as it advances, draws gradually into the bay, where the ebb current takes a S.E. direction on the north and N.W. direction on the south side of the bay, for nine hours, and the flood current three hours, in the opposite direction, which is occasioned by the main current striking on the Skerries and Mount Carmel Head, and producing a counter current.

Winds from the southward and westward prevail for eight or nine months out of the twelve, or two-thirds of the year; the rest are from northerly and easterly points.

Race.

Between the North and South Stack rocks there is a strong current, which is produced by the main tidal wave, both upon the ebb and flood, striking upon this bold projecting headland in its upward and downward passage through the Irish Channel, and is called the Race, from its great velocity, which at springs amounts to five knots an hour, and at neaps to three knots, but when accelerated by heavy southerly gales it exceeds this. Its influence extends for about 1½ mile outwards from the Stacks, and nearly a mile to the north and south of them; so that it may be termed about four miles long and 1½ mile wide. This Race or rapid is extremely dangerous in stormy weather, and when the wind sets against the current, as during a gale from N. to N.W. with the flood, or S.W. with the ebb, a violent and terrific sea arises, breaking in all directions; so that vessels, when once within its vortex, are exposed to imminent risk, and many are said to have been overwhelmed by it, and upon such occasions it is always prudent to avoid it.

Kingstown Harbour lies in a W.N.W. direction, and 54 miles distant from the buoy of the Outer Platters; but taken from the end of the present pier-head, it is near 55 miles, and 47 miles in the same direction to the Kish light on the Irish shore.

Notwithstanding these defects, Holyhead has long been proved by experience to be an efficient packet-station; but in order to render it fit for the larger and more improved class of steam-vessels which are henceforward to be employed here, the present accommodation is by no means sufficient. As a refuge-harbour it is also much used by small trading vessels passing up and down the Irish Channel, when, headed by contrary winds, they cannot weather the head; but the present harbour is much too small as a refuge-harbour, and in N.W. or W.N.W. gales to which the bay is exposed, the anchorage is not altogether safe.

PORT

PORT DYLLAEW.

Port Dyllaew is a fine spacious bay, situated seven miles within a line drawn between the outer boundaries or headlands of the great bay of Carnarvon, viz. Bardsey Island on the south, and the promontory of Holyhead Island on the north. It is formed by a peninsula or neck of rocky land, stretching out a mile in a N. by E. direction from the general line of the shore. The outer or extreme point bears S. by W. ½ W., 22 miles from the South Stack, and 14 miles N.E. by E. from Bardsey Island. Port Dyllaew Bay, properly speaking, is bounded on the north side by the bold projecting point of Carreg Llaun, rising 488 feet perpendicularly above high-water mark, the distance between the two points being 3⅓ miles, and the depth taken from a cord-line drawn between them is 1½ mile. Within these two points there is another small bay, formed by Nevin Point on the south and Point Bodfilias on the north; the distance between them being about 2½ miles, and the depth of the bay 3,000 feet. The soundings taken in a direction across from Port Dyllaew to Carreg Llaun vary from 19 to 39 feet at low water of spring-tides, and decrease from thence gradually to the shore, which is extremely flat at the upper end of the bay, composed of sand above a stratum of clay, forming good holding ground.

The whole bay is clear of rocks, with the exception of that called Carreg-y-Chislyw, which is situated about 1,300 feet in an eastern direction from the extremity of Port Dyllaew Head. This rock is 100 feet long and 50 feet wide, and begins to bear at the last quarter of the ebb between it and the shore. There is a sound 1,100 feet wide, with a depth of 21 to 30 feet at low water.

It is high water at full and change, at 8 hours 30 minutes. Spring-tides rise 16 feet, neaps 9 to 10 feet, and equinoctial tides 18 feet.

The bay is open from the W.N.W. to N. by W., or five points of the compass; but from all other points it affords a safe and convenient anchorage well within the head. The current of tide sets principally from the eastward, running nine hours from that direction and three hours from the westward. During springs the current attains a velocity of three knots per hour near the head, and less at neaps, whilst in the centre of the bay it is scarcely perceptible. The main channel current of tide takes a N. by E. direction from Bardsey Island to the North and South Stacks on Holyhead Island, which are 34 miles distant from each other, and, except in blowing weather from the westward, the in-draught into Carnarvon Bay is not inconvenient, although there is a current, as above mentioned, close to the shores.

The general direction of the coast from Port Dyllaew Head is N. E. by E. for about 10 miles; from thence it tends to the northward. Port Dyllaew Bay is about 12½ miles distant from Carnarvon Bay. The geological features of the coast consist of steep, almost perpendicular hills, 100 to 120 feet high, composed of a thick bed of alluvial deposit, resting upon a substratum of sienite, except at the extremity of Port Dyllaew Head, where there is a band of chlorite schist, approaching to serpentine, and thence to Carreg Llaun and Bodfilias Head, which rise into rugged perpendicular cliffs, from 400 to 500 feet high, of a mass of compact sienite, approaching to granite. The coast is backed by a bold outline of peculiar-shaped lofty hills, amongst which the remarkable peaks of the Rivel, 1,800 feet high, Caern Bodfearn, Nevin and Caer Madeyw mountains are the most predominant. This, combined with the extreme regularity of the soundings, and the absence of all shoals or races of tide, enables vessels to approach and make for the port with the greatest confidence. It is stated, that the tops of these hills are covered with mist during stormy weather from the southward and westward. Admitting, however, that this occurs occasionally, still their bases are visible sufficiently to indicate the coast; and if ever Port Dyllaew should be adopted as a packet-station or refuge-harbour, additional marks, such as lights, beacons, &c., might be erected, so as to remove every cause of doubt in that respect.

The distance from Port Dyllaew Head, according to the Commissioners, Sir James Gordon's and Captain Beechey's Report, and adopted by Mr. Walker, is stated at 60 miles from Kingstown Harbour, in a N. W. ¼ N. direction, and 54 miles from the Kish light vessel.

Taking a line parallel to one drawn between Bardsey Island and the South Stack, Port Dyllaew Point is about seven miles within it, so that it cannot be considered too much embayed; and a vessel in moderate weather, when fit to put to sea, could always work out, even supposing the wind to be contrary.

These advantages have long been known, and Port Dyllaew has in consequence been resorted to as a port of refuge for shipping, even in its natural state, by numerous fleets of shipping. In 1807, Mr. Thomas Rogers, an engineer of some repute, proposed to construct an asylum harbour there, and to make it the principal packet-station to communicate with Dublin, instead of Holyhead; and it appears from the Custom House returns that the following number of vessels took refuge:

	At Port Dyllaew.	At Holyhead.
In 1840 - - -	722 - - -	1,121
1841 - - -	769 - - ·	1,142
1842 - - -	914 - - -	940
1843 - -	900	
TOTAL - - -	3,315 in the last four years.	

Mr. Walker observes, "that there is no shop or store of any kind nearer than Edern, one mile; nor is there the appearance of there having been one; a proof that if on occasions a great number of ships have taken advantage of the harbour, these occasions have not been frequent, or the ships must have remained a very short time;" but the above statement shows that, notwithstanding the absence of all such accommodation, and that the harbour in other respects is quite in a state of nature, nearly as many vessels have taken refuge there as at Holyhead.

If, therefore, such a number of vessels take refuge there even in its present state, it is but reasonable to conclude that if more protection and greater facilities were given, the number of vessels seeking shelter there would be much increased.

The reason of there being no buildings there of consequence arises, I understand, from the difficulty of obtaining land upon proper terms, the title being in dispute.

Having now described the situation and peculiar characteristics of Holyhead and Port Dyllaew, and their respective capabilities of improvement, whether considered as packet-stations or refuge-harbours, or both combined, I shall now proceed to the next and most important part of the question, namely, a comparison between them both, in order to come to a correct decision as to which, under all the circumstances, should be adopted as the permanent station for the packets, and for a refuge-harbour. To establish this question clearly, it will be necessary to examine with the greatest care and caution the respective localities and advantages, as regards the distances, the prevailing winds, the tidal currents, shoals, the means of access and departure, of prevention of deposit, and, lastly, the cost.

First, as regards distance:—Assuming the figures as given by Sir James Gordon and Captain Beechey, and adopted by Mr. Walker, as correct, it appears that Holyhead is 54 miles taken from the buoy of the Outer Platters to Kingstown Harbour, and 47 miles from the Kish Bank on the Irish coast; but as this buoy is nearly ¾ of a mile from the intended present pier-head, the exact distance should be termed 54¾ miles to Kingstown, and 47¾ miles to the Kish Bank; and as during spring-tides and stormy weather the Race, which extends 1½ mile beyond the North and South Stacks, is avoided, and consequently a packet must clear the Race before she makes her proper course, this should be added to the total distance, making it 56¼ miles to Kingstown, and 49¼ miles to the Kish Bank; and Port Dyllaew proposed pier-head by the same authorities is stated at 60 miles from Kingstown and 54 to the Kish, thus making a difference of 3¾ miles to Kingstown, and 4¾ miles to the Kish, in favour of Holyhead. This saving of distance is certainly an advantage of considerable importance, if not counterbalanced by any greater disadvantage.

Secondly, as regards the prevailing winds:—These from eight to nine months out of the twelve, or two-thirds of the whole year, are from W. to S.W. points; and as Port Dyllaew is two points further to windward than Holyhead, to use the very important words of the able hydrographer Captain Beaufort, in his report, "Port Dyllaew courses are W. N. W., E. S. E., so that the most prevalent wind, S. W., would be fair both ways, which is an advantageous circumstance for steamers, as it enables them to steady themselves by canvas."

Upon this point Mr. Walker also observes (*see* Report, page 5), There are cases when they will not apply, and when "Port Dyllaew would have the advantage, as in the case of starting from Holyhead at the first of a flood-tide during a heavy south-westerly gale, which are the prevailing winds, when the steamer must stem the tide, and be nearly in the teeth of the gale, whilst a packet leaving Port Dyllaew at the same time might keep under the land out of the bay towards Bardsey, when the S.W. wind afterwards would be fair across the Channel; and here Port Dyllaew passage would be the best."

This is a great advantage, and is certainly equal to or rather counterbalances the increase of four or five miles in the distance. It is true there will be occasions, such as a N. W. wind and ebb tide, when the Holyhead passage would have the advantage in both respects; but the majority of favourable circumstances ought to decide it, and none can be more important than that the prevailing winds are in favour of Port Dyllaew, particularly during the stormy season, and the long nights and short days of winter, when it is most difficult to preserve a regular and certain communication with Ireland.

Thirdly, the tides and currents:—On the Holyhead passage, the course both going and returning from Ireland is nearly at right angles to the current. In this respect, therefore, their effects are nearly balanced, with the exception of during the spring-tides and stormy weather, when the Race must be avoided. At such times, with the flood-tide and a S. W. gale, a packet would necessarily make considerable leeway, and with difficulty fetch Howth Head, which materially lengthens her passage; whereas on the Port Dyllaew passage, having both wind and tide in her favour, and no Race to contend with, a packet would make the Kish and Kingstown with the greatest despatch and facility. On the return passage the tide would be rather against her, but as the wind would be favourable, this would not affect her materially, although the advantage in point of time would be in favour of Holyhead. With the ebb the Port Dyllaew passage to Ireland would be rather retarded, as compared with the flood, but as the wind would be in her favour, this would not materially affect the passage, whilst it would be in her favour on the return passage; but with a N. W. wind and ebb-tide, Holyhead would have the advantage. As regards the counter-currents setting out of the bay of Holyhead, as well as out of Port Dyllaew, this is nearly the same in both cases; but during stormy weather and spring-tides, as the Race must be avoided, the counter-current would not be so available on the Holyhead as the Port Dyllaew passage. In moderate weather Holyhead would have the advantage, in proportion as the distance is shorter.

Fourthly, as regards shoals:—The Irish coast is skirted with several dangerous shoals, or sand banks; viz. the Kish and Codlin, Bray, India, and Burford Banks, &c. The former is the most important as regards the passage, either from Holyhead or Port Dyllaew to Kingstown; it lies, according to Lowrie's chart, N. E. ¼ E., and S. W. ¼ W., is six miles long, and from a quarter to half a mile wide, with a depth of a quarter to four fathoms on it at low water. The floating light is three-quarters of a mile N. by W. ¼ W. from the north end of it, in about four fathoms. There is some difference as to the precise position of this formidable shoal. Lieutenant Fraser, the latest, and probably the most correct authority, makes it extend half a mile more to the northward than Mr. Lawrie, and half a mile less than the Ballast-office chart, or a mean between the two, and about a mile further to the southward and westward than either of them. According to Sir J. Gordon and Captain Beechey the course to Kingstown from Holyhead lies in a direct line by the Kish light; whereas the course from Port Dyllaew makes an angle of 150 with it; the effect of this, therefore, in lengthening the passage is not material. And the charts of the Ballast-office, Mr. Lawrie, and Lieutenant Fraser, do not differ so greatly from each other as to require, (during foggy and stormy weather, which is the time when danger from these shoals is most to be apprehended), any greater deviation or allowance, supposing that either the one or the other be adopted as correct. It is urged by the Commissioners that it is necessary, in the passage from Port Dyllaew to give a wider berth, to avoid the Kish and the other shoals, than is necessary on the voyage from Holyhead, because an error of a single point in the course would bring the vessel much sooner upon the sands. The reason of this I do not understand; because in any case due allowance in the course must be made to clear these sands, and one would naturally suppose that an able experienced commander in a well-appointed and powerful steam vessel, such as no doubt are and will always be employed, would have no difficulty in such a short run, with the wind in his favour, which it generally is for eight months out of the year, from Port Dyllaew, to avoid them; whereas, on the Holyhead passage, from the packet making greater leeway, or being driven further to the northward, although she would clear the shoals equally well, still, as regards distance, she would have to run nearly the same, with the disadvantage of steaming head to wind. The Commissioners state also, that the tides operate more unfavourably on the Port Dyllaew than on the Holyhead passage. This, as I have already explained, by no means appears so evident, for the reasons above stated. Howth, which has been frequently reprobated as a station, gave the passage from Holyhead considerable advantage, of at least an hour over that of Kingstown, in consequence of Howth being situated further to leeward. (*See* the Evidence of the late Captain Skinner, Lieutenant Browne and Mr. Telford.) It is quite clear, therefore, that as regards the passage from England to Ireland, Port Dyllaew, although rather longer in distance, would have the advantage over Holyhead for at least three-fourths of the year, and as regards the return voyage to England, the distance being less, the prevailing winds fair, and the tidal currents neutral, the Holyhead passage has the advantage of about twenty minutes.

The Naval Commissioners lay great stress upon the effect of tides on the distance during dark nights and hazy weather. This, no doubt, requires the greatest attention; but as under the new arrangement superior packets would be employed, and as the packet with the London evening mail would always make the Irish coast during daylight, the danger of the shoals would be readily avoided, the more so as the Irish coast being a weather shore, with the prevailing winds, the sea is comparatively smooth; and the night passage with the London day-mail, although it would be dark when nearing the Irish coast, still, as the water would be smooth, she would not experience much difficulty, either in the Holyhead or Port Dyllaew passage, in keeping her course.

In like manner the packet leaving Kingstown with the afternoon mail, with the wind favourable, would clear the banks of the Irish coast in smooth water, and make the bold Welsh coast, whether of Holyhead or Port Dyllaew, without difficulty. Holyhead, it is true, is better lighted on account of the vicinity of the south Stack and Skerries lights, but the bold and well-defined coast, the deep and regular soundings, with the addition of another light on Port Dyllaew Head, would enable vessels to run for that port with equal confidence; and the Kingstown packet with the Dublin day-mail would frequently make the Welsh coast in daylight, and with the wind fair would experience no difficulty.

The cases where Holyhead would have the greatest advantage over Port Dyllaew would be during a north-west wind and ebb-tide upon the passage to Kingstown, but upon the return passage, under the same circumstances, Port Dyllaew would have the advantage over Holyhead. Upon the whole, therefore, upon a careful review of this part of the subject, it may be stated, that upon the passage to Kingstown, with the prevailing winds of Port Dyllaew, which is two points more to the windward than Holyhead, it would have the advantage, and on the return voyage Holyhead would have the advantage; but with easterly winds, Holyhead being further to windward, would have the advantage over Port Dyllaew on the return voyage, besides the distance, which cannot be taken at less than five miles.

Upon reading the opinions of the several captains of the Holyhead packets, as communicated in their letters attached to Sir James Gordon and Captain Beechey's Report, it appears that three out of the five, namely, Messrs. Smart, Grey, and Moon, were never at Port Dyllaew, and three out of the eight, in the Appendix to Mr. Walker's Report, were never there, namely, Messrs. Philips, Keane and Smithet; and two out of the remaining five, who have had experience of both places, viz. Messrs. Robert and Thomas Thomas, are very favourable to Port Dyllaew; and Mr. Walker observes, and "believes, from inquiries there made, that the majority of them in the same trade would give a similar opinion."

Fifthly, with regard to deposit in Holyhead Harbour, during these last 20 years, much difference of opinion exists. The Naval Commissioners, Sir James Gordon and Captain Beechey, deny that any material accumulation has taken place; whilst, on the other hand, the soundings by Captain Beechey, taken lately, show a decrease in the depth to the extent of two to three feet. This is difficult to determine exactly, for unless the soundings were taken from the same data, it is impossible to form a correct comparison. It is probable, however, that some accumulation has taken place, as the greater tranquillity occasioned by the pier would be favourable towards it; and this to a certain extent is confirmed by the repeated dredgings.

It is also stated that the sand has accumulated very considerably in the Sound which separates Holyhead Island from Anglesea; this has probably been occasioned by the great embankment over which the new Holyhead road passes, because by intercepting the free passage of the current through the Sound, the sand, which was previously kept in motion, and carried away by it, is now deposited by the stagnation produced by the embankment, which also may have influenced the deposit in Holyhead Harbour. Whether this deposit will increase to such an extent as may in time become a serious obstruction to the proposed new Outer Harbour, is a question which requires further consideration. The great projection of the new works into Holyhead Bay, as proposed by Mr. Walker, would certainly have a tendency to increase the deposit by interfering with the counter-currents which now serve to prevent the accumulation of alluvial matter along the shores. The late Mr. Rennie foresaw this, and, in order to obviate it, took especial care to keep open the Sound which divides the Salt Island, upon which the pier is built, from Holyhead Island, by making a bridge across it, so that the current now passes through it as before; this tends to keep down any injurious deposit in the harbour. As regards deposit in Port Dyllaew, there is no correct evidence of any alteration having taken place, and there can be no reason why decrease of depth should occur, provided that the new works are designed and carried into effect upon proper principles.

With regard to the second, I now come to the important question of the respective harbours proposed by the Naval Commissioners and Mr. Walker, for each port, and their cost.

The plan of the Naval Commissioners for Holyhead consists of an extension of the present pier 800 feet, in three arms or hands, in a N. E. direction, into a depth of 16 to 24 feet at low water of spring-tides, with a corresponding pier on the opposite side, consisting of two arms, leaving an entrance between them of 450 feet wide. This design is upon too small a scale to answer the purpose of either a packet-station, such as will be required, when all the post-office and commercial packets, and those of a larger class, shall be concentrated here, or of a refuge-harbour. For this latter purpose, the entrance is too narrow and too far to leeward to enable vessels when under sail to take it when the winds and sea set into the road to such an extent that they cannot lie there; and the estimate, viz. 200,000*l.*, is considerably below what it would cost.

With regard to the plan of Mr. Walker, for Holyhead, this consists of a packet-station and refuge-harbour combined upon a large scale. The plan is divided into three parts; the first is a steam-packet pier for the proposed larger packets; it consists of an extension of the present, 650 feet on an E. by N. direction, having a jetty about 90 feet long, projecting at right angles to the inner face of the pier, and terminating in a depth of 18 feet at low water of spring-tides; this is estimated at the sum of 78,000 *l.* The second division consists of a breakwater pier to form a shelter for shipping against northerly winds, carried out from the rocks at the north end of Ynys Halen, or Salt Island, in a N. E. direction, 850 feet; then 1,550 feet on an E. by S. direction, and then returned by a curved arm or kant, in a southerly direction, 1,000 feet; thus making a total length of 3,350 feet of pier, having its head or outer extremity terminating in a depth of 20 feet at low water, and 250 yards N. E. by N. from the Stag Rock. By this pier it is proposed to shelter a space of upwards of 70 acres, with an average depth at low water of 18 to 24 feet. The estimate of this work, including the removal of the Inner Platters Rock, is 177,000 *l.* The third division consists in the extension of the packet pier in the same direction, namely, E. by N., 750 feet further, with a jetty projecting at right angles to the inner face of it, about 150 feet. This extension, together with the first and the present pier, will form the packet harbour; and from the extremity of the second division it is proposed to make a return arm 900 feet in a N. E. by N. direction across the Stag Rock, towards the Outer or Breakwater Pier, as described in division second, and leaving 300 to 350 feet wide between them for an entrance. This last division is estimated at 145,000 *l.* Thus the whole will stand as follows:

	£.
First division, extension of old pier, 650 feet long, including the jetty	78,000
Second division, breakwater pier, 3,350 feet long - - - -	177,000
Third division, 1,650 feet - - - - - - - -	145,000
£.	400,000

Thus there would be a total length of 5,650 feet of pier, at the cost of 400,000*l.* I will now proceed to comment upon the qualities, or rather advantages and disadvantages, of this harbour. By the extension of the present pier, although it would give greater accommodation for the Post-office steam-packets, still it would by no means be sufficient, because if a railway is to be made to Holyhead, and all the other stations are to be abandoned, and one grand station alone is to be made here, the great increase of traffic produced by the continual arrival and departure of the numerous large steam-packets belonging to the Government as well as to private companies, which would necessarily be concentrated here to carry on the great intercourse between England and Ireland, would require far greater space and depth than would be obtained by Mr. Walker's proposed extension of the present pier; for I entirely concur with Mr. Cubitt, that if a good railway were "brought from the interior to Holyhead, it would in fact become the port of a greater district than it is now, upon the same principle as a river extended further up into the country would have more traffic in it than before." It is obvious, therefore, that the proposed extension would not do. Moreover, by extending the pier so much further to the N. E., or leeward, sailing vessels in strong N.W. or W. N. W. winds, when they are unable to lie in the roads, could not enter without the greatest difficulty, and in the event of missing the entrance would be driven upon the Pebio Rocks. The late Mr. Rennie was fully aware of this, and in his report to the Local Commissioners of Holyhead Harbour, of the 21st May 1815, when speaking of the extension of the present pier beyond his original plan, makes use of these remarkable words: "It has been suggested that additional space could be obtained, in the least expensive and most effectual manner, by an extension of the pier to the eastward. Now, on examination, this will be found not only to be very expensive, but by no means effectual; for it unluckily happens, that at the distance of 700 feet beyond the projected termination of the present pier there lies a large cluster of sunken rocks, called the Pebio Rocks, which extend nearly 200 yards beyond low-water mark, and come within 150 yards of the line which an extended pier would take. It would therefore be absolutely necessary, if space is to be obtained by an extension of the pier, that it should be carried at least 250 yards beyond the present intended termination; and this alone would cost at least 100,000 *l.*, and when done would not produce all the space that would be wanted, while it would extend the length of the lee-shore within the pier, and, after all, the large vessels would still lie as near the pier-head as they could, and obstruct the entrance; so that even were this large sum of money to be expended, the obstruction would only be partially removed. It therefore seems to me quite as advisable to attempt gaining sufficient room in the harbour by any material extension of the pier. I am, however, of opinion, that if it were extended 40 yards, it would be beneficial, because by such extension some additional depth of water would be gained, and it would not occasion any obstruction to the entrance of the rocks of Carreg Modlen." This extension of 40 yards was accordingly carried into effect at an expense of 16,490 *l.*, and in order to obviate the inconvenience of the shipping crowding the entrance, he proposed to construct a wet dock of 22 acres, on the vacant space in the Inner Harbour, now covered by the tide. This dock Mr. Rennie estimated at 92,074 *l.* Nothing could more completely point out the inexpediency and disadvantage of lengthening the present pier, as proposed by Mr. Walker, than the above opinion of Mr. Rennie; for even at present there is a mooring-chain across the mouth of the harbour, laid down at the express suggestion of the present intelligent and indefatigable harbour-master, Captain Evans, than whom no person is better acquainted with the locality and requisites of the port of Holyhead. The object of this mooring-chain is to enable vessels to lay hold of it by dropping their anchors, so as to prevent them from going to leeward and driving upon the rocks, which has frequently occurred to vessels trying to enter the harbour. This is further confirmed by the instructions issued by Captain Evans for the guidance of vessels entering the harbour, to keep close to the present pier-head, and run as far as they can without shortening sail until the last moment; and this is also confirmed by Lieutenant Sherringham in his report to Captain Beaufort of 8th March 1838. Moreover, by extending the whole pier so far out as shown on Mr. Walker's plan, it will be seen that the soundings decrease as otherwise. It is quite obvious, therefore, that the proposed extension of the present pier would neither give space nor depth sufficient for the great number of large steam-vessels which would be concentrated there, whilst for sailing vessels the harbour would, if anything, be deteriorated; and Mr. Walker himself is evidently of the same opinion; for, in order to provide the requisite accommodation for steam and sailing vessels seeking an asylum during northerly winds, he proposes to construct a great breakwater outer pier 3,350 feet long; and with a view to render the outer harbour still more sheltered, he proposes to extend a return arm 900 feet from the packet pier, leaving an opening between the two of from 300 to 350 feet, inclosing a space of above *eighty acres*. Having done this, Mr. Walker observes (in Report, page 4), "Holyhead Harbour, thus made, would be less in point of area than Kingstown, but would be superior in point of accommodation for steamers, and would possess the advantage of an entrance protected against all winds, which Kingstown does not." If the opinion of the late Mr. Rennie was correct, as regards the extension of the present pier, and in which I entirely concur, it will apply with still greater force to Mr. Walker's outer or refuge harbour; for the entrance being further to leeward, in deeper water, exposed to a heavier swell, and much narrower, no vessel, except steamers, during a gale from the N.W., which is the time when the harbour would be most wanted, could take it, and, if she missed the entrance, would be driven too far to leeward to be able to bear up and enter the packet harbour, and must be inevitably driven upon the rocks. The difficulty of entrance would be still further increased by the particular form of the outer breakwater pier, which is proposed to be made, curved at the return or outer arm. Such a form would tend to increase, rather than check, the swell at the entrance, and thus aggravate the evil which it is intended to remedy. In fact, generally speaking, a curved form of pier is the worst that can be adopted, and in this position particularly so. With regard to Mr. Walker's observation upon the entrance of Kingstown Harbour, it is one of the great merits of that magnificent design of the late Mr. Rennie, that the entrance is open to the dangerous wind when the Irish coast becomes a lee-shore, and when a harbour is most wanted, in order that any vessel, however disabled, even if only floating and driving before the gale, should be able to enter without difficulty; in fact, she should not miss the entrance; and by the particular form of the pier no swell of any consequence could enter the harbour, and any swell which might enter would have ample room to expend itself, without creating any injurious undulation or agitation within. In the same manner, any vessel under sail could get out in any wind when prudent to put to sea. Thus the grand and difficult problem of making a refuge-harbour, easy of entrance and departure, and tranquil within, would have been solved, had all Mr. Rennie's plan been wholly carried into effect; but unfortunately this has not been done, and the piers have been stopped at the very point where they ought to have been continued. The old harbour of Dunleary, with its flat shelving beach (which was expressly included within the west pier, for the purpose of enabling any swell which might pass the entrance during easterly storms to expend itself without recoil), has been allowed to be blocked up by a solid embankment of the Kingstown Railway, which might just as well have been carried upon archways, or have avoided the harbour entirely; a new solid granite perpendicular wharf wall has been built out in the centre of the harbour opposite to the entrance, considerably beyond high-water mark (where, if any thing, the shore already projected too much, and it would have been better to have reduced it). Thus, the sea during easterly gales rolls on uninterrupted through the present defective and injudicious entrance, strikes against and rebounds from the centre landing wharf and railway embankment, and creates such a swell in the harbour that vessels cannot lie in safety; and as a melancholy illustration of the above, no less than eight or ten vessels were driven ashore and wrecked in the harbour during the severe easterly gale of the 16th instant, which could not have occurred if the harbour had been finished as designed by the late Mr. Rennie; and this is the more to be regretted, because these evils were anticipated, and pointed out expressly previously to the objectionable works being carried into effect. So far, therefore, from the entrance of the proposed harbour at Holyhead, as designed by Mr. Walker, being an advantage, it is a great defect, and if proceeded with would render the harbour comparatively useless as an asylum at those times when it ought to be most available.

I now come to the important question of the estimate of the works proposed by Mr. Walker; but as no details are given, either as to the dimensions of the detailed parts, or the prices at which they are calculated, I shall assume them at what the late Mr. Rennie considered necessary, confirmed by my subsequent experience. The principal difficulty, as regards cost, arises from there being no stone in the vicinity of Holyhead adapted for building. The rocks for the most part are composed of what is termed the chlorite schist formation, which although apparently it looks well, yet, when it comes to be quarried, cannot be obtained in such large masses as would be necessary for forming an outer breakwater, opposed to such a heavy sea as that proposed by Mr. Walker, without great waste and consequent extra cost, and when deposited loose in the sea, would become so broken by the waves in the process of consolidating the mass requisite to form a breakwater, that an additional quantity would be required, and the surface must be pitched or paved as the work proceeds, which would entail a heavy extra expense. The late Mr. Rennie knew this well, and accordingly estimated the large rubble at 8*s*. per cubic yard, which, from his great experience in these matters, may be taken at not very far from the truth. It is true that a considerable portion of small rubble would also be required to mix with the large, and might be obtained from the vicinity, which may be taken at a much lower price. With regard to the ashlar or squared stone for the masonry, there is no stone nearer to Holyhead than Redwharf Bay, above 28 miles distant, where excellent compact gray limestone or marble may be obtained, of which the inner wall, parapet, lighthouse, pier-head and jetty of the present pier have been built; but as the quarries are situated on the open shore, exposed to northerly gales, considerable expense is necessarily incurred in obtaining it; so that, except for the purpose of masonry, it could not be employed in the new works, and for this Mr. Rennie's prices are not too much; neither has there been any improvement in the cost or mode of conducting these works since his time; in fact, his system has been universally adopted and employed at the present time.

Estimating, therefore, upon the above data, I consider that the following would be the cost of the several divisions of Mr. Walker's plan:—

	£.
No. 1. Division - - - - -	129,155
No. 2. Ditto - - - - -	462,610
No. 3. Ditto - - - - -	328,560
TOTAL Estimate - - -	£.920,325

This estimate is confirmed to a certain degree by Mr. Cubitt, who, without having the means of going into detail, stated in his evidence before the Post-office Committee, that he considered a proper refuge-harbour at Holyhead could not be made for less than from 700,000*l*. to 800,000*l*.; and if the works be estimated according to the scale of the late Mr. Rennie for the last 40 yards, which were added to the original plan of the late Mr. Rennie, it would amount to considerably more, besides the wharf wall adjoining the shore to the outer harbour, not estimated by Mr. Walker. This is a very large sum to be expended upon a harbour, the more so as, when completed, it would not answer the object intended.

PORT DYLLAEW.

WITH regard to Mr. Walker's plan for a harbour at Port Dyllaew, this Mr. Walker estimates as follows:—

First,—For a packet-station, by extending a pier from Port Dyllaew Head, 300 yards on an E. by S. direction, with a return jetty on Carreg-y-Cheslaw Rock, with ample quay-room for the buildings connected with the packets - - -	£.120,000
Secondly,—A harbour of refuge, by the continuing of the packet pier - -	90,000
TOTAL - - -	£.210,000

The above estimate is no doubt founded upon the superior facilities of getting stone, as both excellent rubble and ashlar might be obtained in the vicinity.

This plan, though sufficient in extent, would require alteration in order to harmonize with the locality; and if ever it should be converted into a packet-station, perhaps a small establishment for the ordinary trifling repairs of the steam vessels and stores might be required, such as are now at Holyhead. The expense of such an establishment would be about 10,000*l.*, and if a dry-dock should be required, an additional sum of 20,000*l.*; this would have to be added to the estimate; but it is a question whether it might not be better to remove the establishment for repairs to Kingstown, where there is ample room for it; indeed, the Commissioners of Revenue Inquiry strongly deprecated the establishment for the repairs of packets at Holyhead, as being unnecessary, for the repairs might be effected cheaper at Liverpool or Kingstown. With regard to the other buildings which would be necessary for the accommodation of passengers and local trade, these would soon arise when required by circumstances, and would pay for themselves. It would not, therefore, be necessary to increase the estimate on that account. The difference, therefore, in the estimates, would be 679,325*l.*, including the establishment for repairs and dry-dock, and 709,325*l.* without, in favour of Port Dyllaew.

As regards the question of deposit, I quite agree with Mr. Walker, that the sands of the Menai are too far distant (12 miles) to occasion any apprehension from that quarter; and as regards the deposit to be apprehended from the washing away of the alluvial shores forming Port Dyllaew Bay, this would be obviated by the bay being protected against the sea by the proposed new pier, and the remainder of the shore, as far as Bodififio's Head, might be protected at a trifling expense by the rock excavated to form the railway. This, combined with a proper form of pier, so designed as not to impede the action of the counter-currents, would effectually prevent the deposit of alluvial matter to any injurious extent.

Having so far discussed the merits of the proposed stations for the packet-station and harbour of refuge, the next question is to compare the two lines of Railway; this is a question which requires much more time than I have been able to devote to it. The inclinations of the line to Port Dyllaew, according to the plans now before the public, are certainly superior to those on the Holyhead line, although in an engineering point of view there is nothing objectionable in the former, with the exception of the crossing of the Straits of Menai, and here a formidable difficulty presents itself, both as regards time and cost. I quite agree with Mr. Walker, that the present suspension bridge is by no means adapted for a railway; and supposing it is, the public ought not to be deprived of it for the use of the ordinary traffic between the counties of Anglesea and Carnarvon. In order to conduct the railway traffic in a proper manner, a fixed bridge is absolutely necessary, and ought to be adopted. The late Mr. Rennie was always of opinion, that a permanent fixed bridge was the only fit means of communication across the Menai; and in his report of the 16th of February 1802, to the Right honourable Charles Abbot, he enters into the whole subject with great detail and ability. For the reasons stated in the report, he says that there are only two situations properly adapted for the construction of a bridge across the Straits, viz. the Ynys-y-Moch, and the Swilly Rocks 800 yards above it; and in this view the late Mr. Telford concurred. (*See* his Report.) Upon the former site Mr. Rennie proposed to construct a fixed bridge, having one cast-iron arch of 450 feet, opening so as to span the entire width of the Straits at low water, and to spring 100 feet above the high-water mark; and from this main arch he proposed to construct smaller arches of stone to the extent of 156 yards on the Carnarvonshire side, and similar arches on the Anglesea side, to the extent of 284 yards, making a total length of 640 yards, exclusive of the wing-walls. This design he estimated at 259,140*l.*, and the other design to cross the Swilly Rocks he proposed to consist of three cast-iron arches, 350 feet span each, and 150 at the crown above an ordinary spring-tide, and to connect these arches on the Carnarvon side by smaller stone arches to the extent of 200 yards, and on the Anglesea side by land arches to the extent of 434 yards, besides embankments; thus making a total length of 1,076 yards; the expense of this design (which he strongly recommended to be adopted in preference to the other) he estimated at 290,417*l.* It is much to be regretted that neither of these designs were adopted, which the expense alone, however, prevented; and the present chain or suspension bridge by Mr. Telford was adopted instead, as it was supposed that it could have been completed for 70,000*l.*; but if the ultimate cost could have been foreseen, it is more than probable that the fixed cast-iron bridge would have been carried into effect. With reference, however, to carrying the railway across the Straits, some similar plan of a bridge ought to be adopted, and taking into consideration the magnitude of the work and the difficulties of the situation, I do not think that it would be prudent to estimate the cost at a less sum than stated by Mr. Rennie, viz. 290,417*l.* The time also for completing such a work, considering its extent and difficulty, and the numerous contingencies to which it would necessarily be exposed, could not be taken at less than from five to seven years. Indeed the present suspension bridge occupied above seven years; and the late Mr. Telford considered that the site of the Swilly Rocks would be attended with greater difficulties.

Having now discussed the respective situations of Holyhead and Port Dyllaew, whether as regards their fitness for packet-stations and refuge-harbours, and the cost of the necessary works according to the plans of Mr. Walker, to render them complete, I will conclude by endeavouring to draw a parallel between them, as far as practicable, in order to enable the parties interested to come to a right conclusion as to which, under all the circumstances, possesses the greatest advantages, and as such ought to be adopted for carrying on the most certain, expeditious and economical communication between England and Ireland.

First, as regards Holyhead.

1. The land of Holyhead projects well out into the Channel, is bold and well defined and lighted; the soundings are deep, and the Channel, though not altogether clear of rocks and shoals, namely, the Outer and Inner Platters, the Stag and the Fenwick, still they are well known, by long experience, and, close to the shore, can be readily avoided; it is consequently easy of access and departure.
2. It is generally clear of fogs, although at times obscured by them; and it is already

provided with the requisite convenience for the transmission of mails upon a moderate scale.

3. It is moreover the shortest distance from Dublin, being only 54¾ miles from Kingstown Harbour, and has long been tried as a packet harbour.
4. The prominent position of the headlands in the main track of vessels passing up and down Channel to the important towns of Liverpool, Chester, Lancaster and other places adjacent, renders it a convenient port for vessels when headed by contrary winds, and as a point of departure when the wind is favourable; but as the bottom of the bay is hard and much exposed during N. W. and W. N. W. winds, and the shores are surrounded with rocks, it possesses at present few advantages for a refuge-harbour upon a large scale.

The disadvantages of Holyhead as a packet-station are,—

1. That it lies to leeward of Kingstown Harbour, and as the winds blow from westerly and south-westerly points for three-fourths of the year, particularly during the long nights and short days of winter, they add materially to the difficulty of the passage.
2. The Race or current of tide runs so strong off the North and South Stacks at spring-tides, that it is extremely dangerous, and therefore generally avoided by vessels; the voyage to Kingstown, therefore, is generally lengthened by it.
3. The great expense of constructing a proper harbour there.

Secondly, as regards Port Dyllaew, the advantages are,—

1. That it is two points further to windward than Holyhead, which, to use the expressive words of Captain Beaufort, "it is a fair wind both ways to and from Kingstown." This is particularly important, because it enables the passage to be made in equal, if not less, time than from Holyhead, although the distance is rather greater during the stormy winter season, when it is most difficult to maintain the communication between the two countries; and as the passage to Ireland is of the most consequence, on account of the Ireland mails being despatched from Dublin after the arrival of the London mail, whereas the despatch of the country mails from London does not wait the arrival of the return mail from Ireland; thus a day would be saved.
2. The clear, well-defined outline of Port Dyllaew Bay, the conspicuous landmarks of the Rivals, Caer Bodfearn and Madryn, the deep regular soundings, the absence of all rocks or shoals, or races, the excellent holding ground, the ample space, all conspire to render the approach easy and certain, the departure equally so, because it is sufficiently prominent to enable vessels to work out when prudent to put to sea, and with the addition of another light would render it equally safe and certain at night. It is therefore extremely well adapted, either for a packet-station or refuge-harbour, or both combined. It is said that the mountains, the Rivals and Caer Madryn, &c., are more frequently obscured by fogs than Holyhead: upon this Mr. Walker observes, "that fogs are prevalent off Holyhead, is proved by the expedients adopted; an occasional lower light is exhibited at the South Stack, when the upper light is obscured, and in addition to the light at the pier; again, a bell and other means are used for guiding the packets to the entrance of Holyhead Harbour in thick weather. My conclusion, therefore, is," continues Mr. Walker, "that the top of the Head is as frequently, or even more frequently, in fog than the top of the Rivals." Mr. Walker also agrees that a refuge-harbour here would be of considerable service, and save many vessels which now get embayed during strong westerly winds, when they cannot weather Holyhead.
3. The small expense, viz. 210,000 *l.*, as stated by Mr. Walker, for 100 acres, which, even including 30,000 *l.* for extra works, would make a saving of 679,325 *l.*
4. Avoiding the necessity of making a new bridge across the Straits of Menai, at an expense of 290,000 *l.*, besides creating a considerable delay of four or five years before the advantages of a perfect railway communication could be obtained.
5. By the adoption of Port Dyllaew, there would be a probability of an inland as well as coast line of railway, which would be the means of giving the public the advantage of a double communication, which is of the greatest importance; and the public should not be deprived of such an opportunity without strong reasons, since it is only by establishing competing lines that the existing abuses can be effectually corrected, and the interests of the public best secured against the evils incident to monopoly; and in this view Mr. Walker concurred—(*see* page 2 of his Report.)

Upon the whole, therefore, taking into consideration all the advantages and disadvantages of both places, and balancing them both carefully together, the question reduces itself to this simple form, whether, for the sake of saving five miles in a sea voyage of sixty, which in moderate weather would make a saving of about 20 minutes, but during gales of wind from the southward and westward, in winter, when it is most difficult to maintain the communication, a passage could be made in equal, or indeed in less time from Port Dyllaew, it is worth while, which *I consider very doubtful*, to sink an extra capital of nearly a million by adopting Holyhead.

I have the honour to be,
My Lords and Gentlemen,
Your most humble Servant,
(signed) *John Rennie.*

No. 2.

REPORT of THOMAS PAGE, Esq., Civil Engineer, on the Eligibility of HOLYHEAD and PORTH-DYN-LLAEN, as Harbours of Refuge, and Packet Stations for communicating with KINGSTOWN.

My Lords and Gentlemen, 2, Whitehall Yard, 30 April 1844.

Instructions.

IN accordance with your instructions "that I should proceed at my earliest convenience to examine the localities of Holyhead and Porth-dyn-llaen, and report to you my opinion upon them, as to the comparative eligibility of each as a packet station for large steam vessels, serving as a point of departure from the Coast of Wales to Kingstown, with such observations upon the winds and tides as might influence the passage, and also as a harbour of refuge for the Channel trade; and lastly, upon the effect of any bridge over the Menai on the navigation of the straits, and the expediency of railway transit upon the bridge," I beg leave to state that I proceeded to Holyhead and thence to Porth-dyn-llaen, and after an examination of the two places, and reference to the Charts and Admiralty Survey of that coast, together with the opinions of several nautical officers on points wherein information exclusively belonging to them was desirable, I have now the honour of submitting to you the following observations:—

Importance of the subject.

The importance of the subject, whether with relation to the means for diminishing the great sacrifice of life and property which is annually suffered by shipwreck, or to the best mode of effecting the most certain and rapid communication between this country and Ireland (a communication of increasing interest both political and commercial), and the difference of opinion which has been expressed by the naval officers and engineers previously consulted, impressed me with the conviction that all the attention which I might be permitted to devote to it, would be requisite, in the attempt to treat it as it deserves, and that much caution would be called for in discriminating between the statements already put forth, and others which might be made to me in the course of my inquiries. This caution has not been lost sight of in deducing the conclusions to which I have arrived.

Although your instructions refer, 1st, to the port as a packet station; 2dly, to the harbour of refuge; and, 3dly, to the bridge and navigation of the Menai, I shall consider them in the order in which they are best disposable.

OF THE HARBOUR OF REFUGE.

Requisites for a refuge harbour.

A HARBOUR of refuge should, in my opinion, be chosen with regard to the following objects:

That it should afford shelter and security for vessels which otherwise must be driven on a lee-shore.

That, with depth of water for large ships, the holding-ground should be sufficiently good to bring a ship up, which may enter it in a gale of wind.

That the nature of the shore should be such as to allow of vessels saving themselves, or at least the crews and cargo, by beaching upon it; and where the formation of a breakwater may be required, it should be so disposed that no injurious effects should result in decreasing the depth of water, &c.

That it should possess an easy access for a disabled ship, during the most violent gales, and that its position, if determined solely with regard to saving life and property, should be such as to afford a refuge on that coast, where, from the direction of the winds and tides, wrecks are most prevalent.

If to these requirements it affords room for working out of the harbour during contrary winds, it will comprehend almost all the requisites for a perfect harbour of refuge.

It is evident that most of these conditions can only be fulfilled in a locality where nature has done much, and where art has to do little; and this conclusion involves another material consideration in the inquiry, namely, the expense, which under the conditions proposed would be the least possible.

The features of the two localities of Holyhead and Porth-dyn-llaen, with regard to their natural advantages for a harbour of refuge, are strikingly different; but a description of them will be best given from the "Sailing Directions for North Wales," 1st July 1843, published by order of the Lords Commissioners of the Admiralty, inasmuch as they particularize those points most essential in the consideration of this part of the inquiry.

OF HOLYHEAD.

Description of the coast at Holyhead.

"THE edge of the coast from Ynys Wellt is low and rocky as far as Holyhead harbour. Off Ynys Wellt there are a number of detached rocks, but as they are close in to the point, and scarcely ever cover, they cannot be called dangerous; and the coast, therefore, may be safely approached till near the Outer Platters, which are a patch of foul ground, lying about one-third of a mile N.N.W. of Ynys Gybi; they do not uncover, and at low-water spring tides carrying as little as two feet water, they become dangerous to vessels running for Holyhead harbour. There is a channel inside the Outer Platters, but as foul ground extends for some distance from both Ynys Gybi and Ynys Wellt, it would be imprudent to use it without the assistance of a pilot.

"From the north-east end of Ynys Gybi, the foul ground extends off shore about two cables' lengths, with only seven feet at low-water springs. The Inner Platters are another small patch of rocks, lying near the pier, and just a wash at low water, but so close in, and out of the reach of vessels, that they need no especial description."

The inner harbour dry at low water.

"Holyhead harbour is a narrow inlet about half a mile in length, but it partly dries at low water, leaving a surface of mud, upon which such vessels as take refuge can be aground, or they can moor to the pier. The ground outside of Holyhead harbour, along the south-eastern shore, is all foul, and the low water rocks uncover to a considerable distance."

Besides these extracts from the description in the Admiralty Survey, may be mentioned the Stag Rock, the Nimrod Rocks, the Piheo Rocks, and others referred to in Captain Beechey's Survey, as follows, wherein he states, "I have found some other dangerous rocks in this bay on the east side, and indeed one near this harbour, between the Stag and the Nimrod; there may be others."

"With the wind from W.N.W., round by the southward to E.N.E. shelter will be found in Holyhead road; but with all other winds it is exposed to a heavy sea in blowing weather."

Race of the tides at Holyhead.

"The Race may be said to extend about a mile and a half off shore, and its chief strength is between the two Stacks. The worst sea there, is with the wind from N. to N.W., and even with S.W. and south winds, when blowing hard at the height of the springs, it is dangerous for small vessels; but with the wind from the eastward, smooth water may generally be expected. The worst part lies about N. by W. from the South Stack light, and distant from it exactly half a mile, and will be avoided by not bringing the Skerries light to the northward of N.E. E. ½ E. In bad weather it will be prudent to keep, if possible, outside of the Race."

Nature of the coast.

Vessels lost in.

Precaution at Holyhead for preventing shipwrecks.

The whole coast being rock, with rocks protruding under low water, the anchorage available must be the result of drift, and not a natural formation; and this opinion is borne out by the statement in the Survey, that the anchorage being good in any part of the bay, by keeping about a mile from the land, is confined to "moderate winds." Along the whole coast there is no place where a vessel can beach in a heavy sea with a chance of safety; and the consequence of a failure in making the harbour may be gathered from the statement given by Mr. Evans, the harbour-master, in which he says, "that several vessels going into Holyhead harbour have been lost on the rocks to leeward, in consequence of not having proper sails set and anchors ready to drop." This description of the coast and holding-ground, confirmed by several statements which have been made to me, and the observation from the Report of the Select Committee on Shipwrecks in 1836, page 7, that 39 vessels* were on shore in Holyhead bay, 20 of which were totally lost, with all their crews on board, are sufficient to prove that, for the purpose of a harbour of refuge, the natural advantages of Holyhead, as they relate to its coast and holding-ground, are very limited. Its bold headland is, however, easily made; it has an efficient establishment for assisting vessels in distress, and by whose activity, under the able directions of Mr. Evans, the harbour-master, a great number of vessels has been saved, which, from the nature of the coast, must have been totally lost. A chain has been moored across the entrance to prevent vessels dragging out, and indeed nothing seems to have been omitted to overcome those disadvantages which, as a harbour of refuge alone, nature has assigned to it.

OF PORTH-DYN-LLAEN.

Description of Porth-dyn-llaen from Lewis Morris' survey.

The bay of Porth-dyn-llaen seems to have been well known to the Admiralty surveyors in the time of Lewis Morris,† who speaks of it and of Nefyn as follows: "These are very safe and excellent harbours for ships that may be driven by stress of weather into Caernarvon bay. The pier at Porth-dyn-llaen, which was begun to be raised by a gift of 600*l.* from King George the First, but never finished, is now almost in ruins, and if not looked after, this excellent harbour will be greatly destroyed.

"There is a small pier at Nefyn, which is found very useful for the herring-fishery and coasting vessels. This pier is falling to decay."

Description from the Admiralty Sailing Directions.

In the Admiralty "Sailing Directions for North Wales" (1843), before quoted, the bay of Porth-dyn-llaen is described as "clean throughout, with the exception of the rock called Carreg-y-Chwislen, which may be approached within 50 yards on all sides, is two cables in length from Porth-dyn-llaen Point, leaving a clear sound with five fathoms. The bottom is sand over clay, and the depth decreases gradually to the beach. In its present state the bay affords no shelter with the wind from W.N.W. to north,‡ but from all other points of the compass it may be adopted as a convenient and safe anchorage."

In the bay of Porth-dyn-llaen, as also in the adjoining bay of Nevyn, there is an extent of coast of 5,000 yards in length, in which a vessel may beach; the holding-ground is sand over clay, the latter appearing in many parts through the sand, between high and low water marks. Protected by its own promontory, and the high lands behind it, from the prevailing gales, and shut in by the Rivels from the east, it is open to few points of the compass.

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* The statement in the Report of the Committee is, "That no less than 39 vessels were seen on shore in Holyhead Bay at one time, 20 of which were totally lost."

Referring to the evidence of Captain Evans, p. 77, it will be seen that this number is, however, the result of several years' observations.

† For reference to the chart, and observations by Lewis Morris, I am indebted to Capt. Beaufort, R.N., Hydrographer to the Admiralty.

‡ Seven points.

The Rivel mountains, whose peculiar summits distinguish them from any others on the coast, the cliff called Carreg Llam, and the mountains of Carn Bodfearn and Carn Madryn, afford excellent landmarks, the advantages of which may be better described from the Admiralty "Sailing Directions."

Character of the coast by the Admiralty surveyors.

"The general character of the coast, up to the point at which it turns towards the bar of Caernarvon, is high, but gradually lowering to the water's edge, being in fact the foot of a lofty and steep range of mountains; the most remarkable of which is the Rivel, or, as it is called by the Welch, Yr-Eifi, and one of the best landmarks in Caernarvon and Cardigan bays. From the northward, in rounding Holyhead, it shows three remarkably sharp peaks: the middle and highest of these is 1,866 feet above the sea, to which it rapidly slopes down, and terminates in a noble and picturesque cliff, forming, with the peaks, so remarkable a feature in the coast that it is impossible to mistake it, and therefore serving as an infallible mark for knowing the land, and determining a vessel's position. Between it and Porth-dyn-llaen, the stupendous cliff of Carreg Llam rises almost perpendicularly from the water to the height of 400 feet, with clouds of sea-fowl always hovering about it; and this cliff at once leads the eye to Porth-dyn-llaen Bay.

"The general set of the tide in the bay is from the eastward along the shore, and through the sound for nine out of the twelve hours. In the former case it is very gentle, even at the springs; but in the sound, it then runs three knots."

Comparison of the two ports.

Comparing, from this accurate description of the two localities and my own observations and inquiries, their natural capabilities in the most important features which may fit them for harbours of refuge, viz. *the holding ground*, which in one is a natural formation, clay to the surface, and which has enabled vessels to ride out tremendous gales, and in the other the probable result of drift—*the facility of beaching* so extensive at Porth-dyn-llaen, and so limited, if any can be assigned to it, at Holyhead—*the shelter afforded* to vessels by the natural protection in each place—*and the strength and set of tides* which are regular and gentle at Porth-dyn-llaen, and amount to a race in the neighbourhood of Holyhead—I am decidedly of opinion, that for a barbour of refuge the bay of Porth-dyn-llaen is preferable to the bay of Holyhead.

Porth-dyn-llaen preferred to Holyhead, as a refuge harbour.

In coming to this conclusion, I have considered all the objections which have been made to the bay, and am of opinion that some of the circumstances stated as objections afford arguments in its favour; such, for instance, as the long ebb tide of nine hours, causing an indraught into Caernarvon bay, which tide being an off-shore tide at Porth-dyn-llaen, is opposed to the prevailing winds, and would assist a vessel coming in at the east entrance. The tide also, both ebb and flood, running through the sound would maintain such depth of water in-shore as it might, for other purposes than those of a refuge harbour, be desirable to maintain.

Another advantage which Porth-dyn-llaen possesses, is the shelter afforded in all gales from the eastward on the west side of the point where the Holyhead sailing packets have occasionally landed their mails and passengers when they could not get into Holyhead.

Remarks on the high ground at Porth-dyn-llaen.

With regard to the high ground enclosing the bays of Porth-dyn-llaen and Nevin, which consists of sand over clay, but with slight exceptions grassed over, I have satisfied myself by careful examination that any slip in this part is attributable to the land springs, and that there is every facility and abundant space for the construction of buildings and docks which may be required, with very little labour or outlay; the stone being at hand, the space at low water being 750 feet, and the bottom being clay, will confirm this opinion.

Of the lighthouses near Holyhead.

The stress which has been laid upon the advantages attributed to Holyhead in being well lighted, I have not overlooked; but it is evident that of the lighthouses enumerated, all of them, excepting the pier light, would be requisite for the navigation of that part of the Channel, if there were no harbour at Holyhead, and even were they not requisite, surely in the consideration of a subject of such moment, we should not reason on bringing the harbour to the lighthouses, but the lighthouses to the harbour.

Importance of a light on the point of Porth-dyn-llaen.

A light on the point of Porth-dyn-llaen (which projects 3,500 feet from the shore) would be of essential service in the navigation along this coast, as it would form the connecting link between the light on Bardsey Island and the South Stack, and, with a subordinate light, would give a vessel making Porth-dyn-llaen the advantages now attached to Holyhead.

No cause for the apprehension of drift.

On the subject of the drift apprehended from the Menai (which has been alluded to in one of the Reports on this subject, though the Menai is 14 miles distant on the coast), I am of opinion that there is no reason for any such apprehension. Beyond Rivel Head is a low shingle beach with large loose stones; and other "shingle beaches, with stones in patches, between Trwnytal Point and Belan Point," are mentioned in the Admiralty Survey, which do not indicate any drift of sand. Moreover a drift into the bay of Porth-dyn-llaen would accumulate on the clay, which, as I have remarked, actually projects through the sand in several places between high and low-water marks; and the fact of the African steamer, when she anchored in the bay, having brought up clay on the fluke of her anchor (a parallel case with many others), shows no accumulation of sand below the low-water line. It is, however, right to refer to a sounding marked as six fathoms on Lewis Morris's Chart, where, in Commander Sheringham's Survey, not more than 30 feet are shown. As this is in the sound, where the depth of water would be maintained by the tide, the difference is not easily accounted for.

Clay brought up on the anchors.

Conflicting statements as to Holyhead and Porth-dyn-llaen.

On visiting both Holyhead and Porth-dyn-llaen, the result of inquiries were as contradictory as those which have appeared in other Reports upon the subject; and there was such an evident partiality in the answers, to one or other of the ports, that I have not considered it safe to rely implicitly upon either, but have come to the conclusion with respect to a refuge-harbour from disinterested information, which, it is satisfactory to me, coincides with the views stated in the Admiralty Survey.

Of their position as refuge harbours.

Referring to the position of Holyhead and Porth-dyn-llaen as refuge-harbours for the Channel trade, it is evident that the value of either, in this point of view, depends on the position of the ship and the direction of the gale. The object with outward-bound ships is to maintain their distance, and to effect this they would run to the nearest port, supposing the advantages of both equal; but for vessels which otherwise must run ashore in Caernarvon Bay from Bardsey Island to Holyhead (and even in Cardigan Bay, provided they can clear Bardsey Island), Porth-dyn-llaen would afford, at an inconsiderable outlay, a ready and safe harbour; and the necessity for such a harbour may be shown by the fact that there are 10 vessels wrecked on this coast of Wales for one that is wrecked on the opposite coast of Ireland. Although situated in Caernarvon Bay, the port is not in a position to be called "deeply embayed," being not more than three nautical miles further than Holyhead Harbour is, to the eastward of a line drawn from Bardsey Island to the South Stack; allowing that rock a berth of two miles, as recommended in the "Sailing Directions" for the coast. An outward-bound vessel leaving Porth-dyn-llaen would therefore be in the Channel as soon as one leaving Holyhead.

Vessels passing down the Channel from the Clyde and the ports of Cumberland generally keep on the Irish coast, making Wicklow Head, which is immediately opposite Porth-dyn-llaen: to all these vessels, therefore, and to others coming from the southward, which could not pass Holyhead, it would be highly advantageous as a refuge harbour; whereas, with regard to Holyhead, any vessel that could round that promontory would find refuge in Bull Bay, Red Wharf Bay, or in Ramsey Bay in the Isle of Man, according to their destination.

Holyhead as it is.

Respecting Holyhead harbour as it is at present, I may observe, that at low water it contains only 4½ acres, varying in depth from 11 to 6 feet, and 6 acres varying in depth from 6 feet to 0, and that at the pier (which was constructed especially for the Post-office packets, and not with a view of forming an asylum harbour), the then depth of water was 14 feet at low-water spring tides. Comparing the soundings at that time with those in the Survey of Captain Beechey in 1840, I find a decrease in the depth of water of from three to four feet; and with reference to my own soundings, there is not more than nine feet six inches average depth of water at low-water springs.

Decrease in depth of water.

This circumstance, coupled with the expense annually incurred for dredging, shows that a deposit is continually taking place, and that without recourse to means for removing it, sufficient depth of water could not be maintained for the packets.

This conclusion will not be affected in the least by the note appended to the Report of Admiral Sir James Gordon and Captain Beechey, in which it is mentioned that "some implements lost in 1817, outside the pier-head, were found by the workmen employed in the diving-bell in 1831;" and which is adduced by those officers as a proof that a harbour at Holyhead would not be likely to fill up. A sea which occasionally breaks with great force over the pier, may be supposed to keep the bottom outside the pier-head free from deposit; but the observations on deposit apply to the bottom when enclosed as a harbour.

The deposit would accompany the extension of the pier.

As the silting up has gradually taken place inside the pier, any extension of the pier (other circumstances affecting it being unchanged), would be followed by the same result; viz. an extension of the deposit; besides, it is evident that an extension of the pier would not include sufficient space for the number of steam vessels which might be calculated on, if Holyhead be selected as the point of communication with Kingstown.

In the plan proposed by Mr. Walker for a harbour at Holyhead (Report, 6 October 1843), and on which you request me to state my opinion, it will be seen that not only is it intended to extend the present pier, but to enclose part of the bay by a breakwater from the northern point of Ynys Gybi, leaving an entrance of 300 to 350 feet in width on the eastern side.

Objections to the proposed harbour at Holyhead.

The objections to this plan which I may be allowed to suggest are, that a ship which can enter it must come in in the very teeth of the prevailing gales, an objection which applies to the present harbour, and from which cause, as stated in the "orders" of the harbour-master, many vessels have been lost on the rocks; also that the width is not sufficient to insure the entrance of disabled ships, even were it more favourably situated; the opinion of nautical authorities (who in fact are on this point the only authorities to be relied on), being that 700 to 1,000 feet* would not be more than sufficient; and another objection to it is, that by encroaching so much upon the bay, it subjects a ship which may miss the entrance to greater danger by driving her so much nearer to a lee-shore.

It will be seen that in some of the requisites cited by me for a harbour of refuge, namely, good holding-ground, and a shore on which a ship may beach (in case of damages which would sink her in deep water), I differ from Mr. Walker, who considers that "the bad holding-ground outside the harbour will be of very little consequence, if vessels by entering the harbour have little or no occasion to anchor outside; and the same reason renders the rocks round the bay comparatively harmless." These remarks apply altogether to vessels inside, but there are numerous cases, as I have before pointed out, where vessels have missed the present entrance, which is more than 120 feet wider than that proposed, and in a less exposed position, and have been lost in consequence on the rocks.

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* Captain Bullock's Evidence before the Select Committee of the House of Commons on Shipwrecks, 10th August 1843, p. 285.

Importance of good holding ground.

Admitting it is of less moment that the holding ground should be good inside a harbour whose entrance is opposed to the prevailing gales, yet its importance in this position on a rocky coast may be attested by the six wrecks in Kingstown harbour during the late gales.

The entrance to a refuge harbour should be made, not so much for a ship fully rigged and well manned, like a ship of war, but with regard to the condition of a merchant vessel, with a thin crew harassed by fatigue, disabled in her rigging, and altogether ill-calculated to steer very nicely into a pier harbour.*

Increase of the Stanley Sands.

There is, moreover, another consideration, which seems to have escaped altogether the notice of those who have examined and reported upon the harbour of Holyhead, namely, *the progressive advance of the Stanley Sands*, to show which more clearly, I append to this Report a Chart, on which the sands and soundings in the bay, from Mr. Thomas's survey in 1816, are compared with the same in the survey of Captain Beechey in 1840, and by which it will be seen that the sand has advanced 5½ cables (more than half a nautical mile) in 24 years, in a place where the depth of water at low water varied generally from three to eight feet.

Geological investigation suggested.

That it is still nearly a mile from the entrance of the proposed harbour, and that the rate of increase, as it enters deeper water, will be comparatively much less, are true; but as the proposed harbour would be free from any run of tide, and this drift is gradually approaching it, the effects of accumulation at some future time (probably at no great distance) should now be taken into serious consideration, and should, together with the nature of the holding ground, be treated by more geological knowledge than has yet been brought to bear upon it. What proportion of these sands is due to the detritus of the River Alaw, and what due to the drift from the sea, are questions which ought, certainly, to be determined before any plan involving the expenditure which must be required for a harbour in the bay can be acted upon.

Decrease in depth on the site of the proposed harbour.

This inquiry is of the greatest importance, inasmuch as by comparing the surveys of Mr. Thomas and Captain Beechey, a diminution of a fathom in the depth of soundings is shown in 1840 on the site of the proposed harbour.

Similar case at Howth.

A reference to the expense incurred at Howth harbour (an amount exceeding 400,000 *l.*) which, by the want of attention to the precautions here suggested, was altogether thrown away, will show the importance of this consideration.†

SUGGESTIONS FOR PORTH-DYN-LLAEN AND HOLYHEAD.

For Porth-dyn-llaen.

(A.) Plan 1.

(B.) Plan 1.

Reasons for keeping the Sound open.

THE arrangement I would suggest for a refuge harbour at Porth-dyn-llaen, which by the form of the bay will allow of a harbour of great or small capacity, is shown on Plan No. 1; it contemplates the extension of a breakwater from Carreg-y-chwislan to the eastward, which can be terminated at any point consistent with the area of sheltered anchorage required. With 5,600 feet of breakwater it would protect 400 acres, varying in depth from 12 to 30 feet, or by an extension in another direction of 8,650 feet, the space inclosed would amount to 960 acres. The Sound is proposed to be kept open, allowing easy access for vessels in that direction, and continuing the outlet for the sweep of the ebb tide round the bay, without interruption. Thus, the existing state of the shore and of tide would not be much interfered with, an object of importance with regard to its future maintenance.

Well provided with materials.

Few localities are so well provided with the materials for the construction of works as Porth-dyn-llaen. The greenstone of the point, which will afford large blocks (samples of which may be seen on the old quay), the granite of Penrhyn-Bodfilias, and of the Mount Gwyliwr—all of which I have carefully examined, and which may be obtained at a low cost —leave nothing to be desired for a stone structure; and, as I have before observed, there is every facility for the construction of packet berths and other works required on the shore.

For Holyhead.

At Holyhead, the most judicious course, in my opinion, would be to inclose the bay between Ynys Gybi and the Clipera rocks by a strong breakwater, leaving two entrances of 800 feet in width; the length of the breakwater would be 9,900 feet (4,600 feet longer than that proposed by Mr. Walker); but the area inclosed, limited by soundings of 12 to 38 feet at low water, would be 900 acres, being 820 acres more than the number contained in the harbour referred to, namely, 80 acres.

The value of this proposition, or indeed of any other, would depend on the result of that geological investigation of the sands to which I have alluded.

Site for a harbour west of the Platters.

Another arrangement for a harbour by a breakwater from the rocks eastward of Ynys Wellt Point to the Outer Platters (shown on the Plan No. 2), which, with about the same length of wall, would inclose nearly double the area of Mr. Walker's proposed harbour in this position; the holding ground would, I fear, be an objection, but the site would be free from drift. I am informed, however, by an intelligent officer in the packet service, Commander Davis, that if a harbour is to be formed at Holyhead, it should be still further westward, to prevent the liability of ships being wind-bound, as they now are, in the bay.

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* So much is a pier harbour generally dreaded, that in cases with which I am acquainted, a pilot who has been requested by the owner of a ship to run for Ramsgate harbour, has given his opinion that he would sooner beach the vessel at Sandgate than run the risk of clearing the pier head; yet, to this harbour all ships pay a passing toll, the amount of which increases with the size of the ship, so that the ship contributing the greatest amount can never enter the harbour to which she pays.

† The position of Howth harbour with relation to course and distance is preferable to that of Kingstown for the run to Holyhead, and the change affords an instance of the shortest distance not having been a primary consideration in the selection of a port. It is worthy of remark that the Kish Bank was brought up as an objection to the passage between Holyhead and Kingstown, in the same manner that it has been in the discussion about Porth-dyn-llaen.

OF THE ESTIMATES.*

On the subject of the estimates for a harbour at Porth-dyn-llaen, or at Holyhead, it must be remarked that in the former case all the material is on the spot, and the latter, a great portion must be obtained from the Penmon quarry or other quarries in Anglesea, at a considerable distance, supposing the limestone to be used. Taking the filling as Holyhead stone, and with prices obtained of contractors for the other, the following are the estimates for the harbours according to the sections of the breakwaters contained on the Plans Nos. 1 and 2.

	£.
PORTH-DYN-LLAEN.	
Breakwater, as suggested on Plan No. 1., to enclose 960 acres -	1,021,000
Ditto - - - - - ditto - - 400 acres -	411,000
Ditto - - - - - ditto - - 100 acres -	200,000
HOLYHEAD.	
Breakwater, as suggested on Plan No. 2, to enclose 900 acres -	1,872,000
Breakwater and extension of pier, as proposed by Mr. Walker to enclose 80 acres - - - - - - - -	915,000

OF THE PORTS OF HOLYHEAD AND PORTH-DYN-LLAEN AS PACKET STATIONS.

Conditions for a packet station different from those for a refuge harbour.

The advantages of either port as a packet station depend upon other considerations than those taken into account for a refuge harbour.

The precision with which a steamer can be managed, compared with a sailing vessel, renders the access to the harbour generally of less importance; and the rocky shore of Holyhead, or beach of Porth-dyn-llaen, will therefore not be considered for or against, on this part of the subject. There are, however, points of great importance on which opinions differ, and which nothing but trials can fairly set at rest: these are the facility with which each port can be made, and the comparative length of the voyages.

On the facility of making the ports.

On the facility with which each port can be made, opinions are given in the Appendix to the Report of Admiral Sir James Gordon and Captain Beechey, and also in that of Mr. Walker; but of the five officers whose letters are appended to the former Report, four had not visited Porth-dyn-llaen, and the fifth is uncertain; and of those in the Appendix to the latter, four had not been there, two do not state if they had or not, and of the remaining two, one is in favour of Holyhead and one for Porth-dyn-llaen.

The conflicting statements found in these letters as to depth of water, &c., which a single glance at the Admiralty Charts would correct, and the similarly conflicting assertions which have been made to me both at Holyhead and Porth-dyn-llaen, induce me to rely most on the impartial statement of Commander Sheringham, who is intimately acquainted with the whole coast, and whose descriptions of the facility of making both are given in the Admiralty directions, and by which and even the statements referred to, there appears to be no advantage in either case.

On the comparative length of the voyage.

Regarding the comparative length of the voyages, which on a superficial view of the subject, would be estimated by the distance, a remark in the Report of the Irish Railway† Commissioners, though applied to land communication, is of such moment that I shall here quote it. "In making comparisons of this kind the actual distance is commonly assumed as the measure of the time, a form of calculation sufficiently accurate for ordinary purposes, and where other circumstances concur in favour of a particular conclusion; but in a nicely balanced case, time being the only or principal consideration, it should be well understood that a mere comparison of distances may often prove a fallacious mode of estimating the time necessary for travelling over a given space. There may exist on the one hand peculiar and unavoidable causes of delay, such, for example, as will be presented in the passage of the Menai Strait on the Holyhead line, while inferior gradients, should they prove so, may retard the progress equally on the line to Porth-dyn-llaen."

Greatest average of rapidity and regularity required.

To this may be added, that in the present case, as the object is not the attainment of the shortest passage under favourable circumstances, but *a series of passages which shall include the greatest average of rapidity and regularity*, so the effects of wind and tide may be more than sufficient to counterbalance the difference of distance.

To,

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* Although the estimates are not given in detail in this Report, all the quantities have been carefully calculated at fair prices.

† *See* Report of the Irish Railway Commissioners, July 1838, p. 72.

Proceedings for ascertaining the prevailing winds, and their bearing on the subject.

To enable me to express an opinion on this part of the subject, on which so little in reality is known, I have procured copies of the Register of Winds at Holyhead* during the last three years, and have had them arranged with the force due to each, on the points of the compass, showing the number of days on which each wind prevailed, and the mean force; the product of which may be used for expressing the effect of each wind upon the voyage. In the period referred to, it will be seen that the result corroborates the generally received opinion that the prevailing winds are considerably more in favour of the passage between Porth-dyn-llaen and Kingstown than between Holyhead and that port; that the beam winds† are more than 50 per cent. in favour of this passage, and those against the ebb-tide in a much higher ratio. The results being given in the diagram and in the tables accompanying this Report, it is not necessary for me to go into further particulars.

Prevailing winds in favour of Porth-dyn-llaen, referred to by Capt. Beaufort.

The advantages which Porth-dyn-llaen possesses over Holyhead in position, as regards the prevailing winds, has been mentioned by Captain Beaufort, the Hydrographer to the Admiralty, in his Report, dated 4th November 1836, in which he states, "that the courses would be W. N. W. and E. S. E., so that the most prevalent wind (S. W.) would be a side wind both ways, an advantageous circumstance to steamers, as it enables them to steady themselves by canvas."

It has also been referred to in the letter of Lieut. Philipps,‡ who thinks "that Porth-dyn-llaen would be exempt from the strong tides and heavy sea of the race of Holyhead, and that the difference in crossing the Irish banks would be very trifling."

Opinions on the advantage of a beam wind, by Commander Davis and Lieut. Hosken.

I may here also refer to the opinions of Commander Davis and of Lieutenant Hosken, the commander of the Great Western steam ship, to whom, as well as to others, I particularly referred on this subject to ascertain the value of the 2½ points which is the difference between the courses from Porth-dyn-llaen and Holyhead. The former states, "that a favourable wind will give two to three knots, according to the roughness or smoothness of the sea;" and the latter, "that the advantage would be very considerable on the part of the vessel having the wind on the beam; that the difference in fast vessels would be two or three knots." These remarks were not made with any reference to the advantage of one port over the other.

Tides affecting the voyage from Holyhead,

With regard to the tides, Holyhead being the promontory round which the stream of flood sets with great rapidity as it fills the Bay of Liverpool, and the great expanse between the coast of Ireland and that of Cumberland, a steamer must stem this tide for a considerable distance, and again, on the ebb, must be subject to the stream as the waters northward empty themselves through the Channel into Caernarvon Bay. Both these effects must retard the passage, and require great allowance for correction of the course, which I am informed amounts sometimes to two and even to three points.

And Porth-dyn-llaen.

A steamer from Porth-dyn-llaen would have the flood in her favour towards Kingstown, and the ebb with her from that port; the ebb would be against her from Porth-dyn-llaen, but the beam winds would be in her favour: thus the position of the port, and the effect of the winds and tides, would be towards a regularity of passage, which it would appear is not attained by the Holyhead line, the length of some of the passages to Holyhead *causing a delay*|| *of two hours in the general transmission of the mails* to London. These long passages have generally occurred with the wind at E. S. E., and the long passages in the contrary direction with the wind at W. N. W. The very circumstance affords sufficient proof that the diminution of distance between two points affords very little facility for rapid and regular communication, if the effects of wind and tide are adverse; a remark which will be illustrated by the subjoined table, showing the long passages between Holyhead and Kingstown in each direction during 12 months, in 1841 and 1842.

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* To the Table of Winds at Holyhead is added a Table from the register kept at the Royal Observatory at Greenwich, with the mean force. This Table was compiled before the register at Holyhead was obtained. A great difference in the force will be observed.

† The following paragraph from the *Nautical Magazine*, April 1844, bearing on this subject, may be interesting:—"The cause we should assign for a 'beam wind' being the best to produce velocity in a ship is, that the position of the sails with reference to the power of the wind, allows every inch of canvas to become exposed to the pressure; and therefore the propulsion must, abstractedly considered, be in excess over that which is given on any other point of sailing; all the angular sails act, and there is less 'bellying' of the square sails; and according to the stability or stiffness of the vessel, so will the advantage be regulated. It is obvious too that the full pressure of the wind is exerted upon the whole of the sails, which is not the case on a wind, for then the direction of a force is oblique, and the lee portion of the sails becomes almost useless; and with the wind right aft, though a greater number of square yards of canvas should be spread, the sails on the masts being in a line ahead, a portion of the effective force is lost or but partially supplied."

‡ Appendix to Mr. Walker's Report.

|| *See* Report of Irish Railway Commissioners, July 1836.

DATE.	Name of Packet.	LENGTH OF PASSAGE To Kingstown. H.		To Holyhead. H.		WIND.
		H.	M.	H.	M.	
1841:						
February 2	Zephyr	6	20	13	45	E.
— 3	Otter	6	8	21	11	E. S. E.
— 4	Sprightly	6	8	19	22	E. by S.
— 5	Zephyr	6	30	14	55	E. S. E.
— 6	Doterel	6	38	11	54	E S. E.
— 11	Zephyr	-	-	10	29	S. W. by S.
— 26	Otter	11	20	5	50	N. N. E.
March 10	Doterel	13	25	6	11	
— 30	Otter	11	30	6	0	S. W.
— 31	Zephyr	11	34	6	4	W. S. W. to W.
June 23	Doterel	5	50	11	0	S. W.
July 10	Otter	10	45	6	5	W. N. W.
— 28	Zephyr	18	45	6	15	W. N. W.
Sept. 19	Sprightly	6	30	10	55	S. S. E.
— 20	Doterel	6	30	10	40	S. E.
October 12	Zephyr	10	15	6	22	N. W. N.
— 14	Doterel	12	47	6	11	W. S. W.
— 17	”	18	3	6	12	N. N. W. to N. W.
— 19	Sprightly	11	53	6	8	S. E. to N. & N. W.
— 20	Doterel	16	40	7	27	W. to W. S. W.
Nov. 12	Sprightly	15	25	8	15	W. N. W.
— 22	Doterel	10	3	5	49	N. W. by W.
— 23	Zephyr	11	7	6	13	W. to N. W.
December 4	Otter	18	22	6	15	N. W.
— 6	Sprightly	11	5	5	46	S. W. to W.
— 8	Doterel	10	32	5	37	N. W.
— 10	Otter	13	20	6	24	N. W.
— 13	”	12	35	6	39	W. S. W. to W.
— 14	Doteral	10	30	6	7	N. to N. N. W.
— 15	Zephyr	12	50	6	23	W. S. W.
1842:						
January 16	”	11	48	6	19	N. W.
— 22	”	10	35	6	24	S. W. to W.
— 27	Sprightly	11	0	6	23	N. W.
February 10	Doterel	10	55	6	30	S. W.
— 12	Otter	11	38	6	6	W. S. W.
— 13	Doterel	11	30	6	49	Var. S. to W. S. W. & W
— 26	”	10	17	6	8	W. N. W.
— 27	Sprightly	16	58	6	7	S. W. to W. S. W.

Experience, therefore, cannot be cited in favour of the regularity of passages to and from Holyhead.

Distances and Comparative Lengths of Voyages.

Course of a steamer from Porth-dyn-llaen.

Before stating the comparative distances of the ports, it is requisite to remark, that a steamer starting from Porth-dyn-llaen would proceed direct to Kingstown, over the Kish, if after half-flood, as the Holyhead packets do at this time of tide; or she would run for the Swashway, between the Kish and Bray Bank, having four fathoms water at low water; or, she would round the north end of the Kish Bank, according to the state of the weather and the direction of the wind. To make fair allowance in comparison, and to include any objection raised to the passage, I shall take the distance round the north end of the Kish which would make her course two degrees more to the north than if she ran direct to Kingstown.

Course of a steamer from Holyhead.

A steamer starting from Holyhead would, in fine weather, or with favourable winds and tides, round the Platters, and then run direct for Kingstown; but in blowing weather, to avoid the race, she would run for the smooth water, between the races, a point which I am informed, by Commander Davis, is about the middle fifth part between the North Stack and the Skerries. As I have taken the course from Porth-dyn-llaen, assigned to it in unfavourable weather, I shall also take the course from Holyhead, under the same conditions, and refer to the several points on the charts, the positions of which are as follow:—

	From the Admiralty Charts.	
	North Latitude.	West Longitude.
	° ′ ″	° ′ ″
Entrance to Kingstown Harbour	53 18 00	6 8 00
The Kish Light-ship	58 18 53	5 57 00
The Platters at Holyhead	53 19 30	4 37 30
The centre of the smooth water, to which steamers, in bad weather would make, to avoid the race, before shaping their course for Kingstown	53 22 25	4 38 40
The Sound at Porth-dyn-llaen	52 57 00	4 34 00

The respective distances would therefore be—

From the Platters at Holyhead to Kingstown	54·12	nautic miles.
From the Packet Berth to the Platters	·78	„
Distance from the Packet Berth to the entrance of Kingstown Harbour, in favourable weather	54·90	„
From the comparative smooth water between the races at Holyhead	53·32	„
From the Packet Berth to the smooth water	3·75	„
Distance from the Packet Berth at Holyhead to Kingstown, in rough weather	57·07	„
From Porth-dyn-llaen to Kingstown, direct	60·21	„
From Porth-dyn-llaen to the Kish Light	53·90	„
From the Kish Light to Kingstown Harbour	6·60	„
	60·50	„

The difference in distance will therefore be—

In fine weather - - - 60·21—54·9 = 5·31 nautic miles, or 6½ statute miles.

And in rough weather - - 60·5—57·7 = 2·8 „ or 3⅓ „

With these distances, and the prevailing winds, an estimate may be formed of the comparative runs with vessels of certain build and power.

Experimental trip of the Princess Royal to Kingstown.

To arrive at the probable time required for the run across the Channel, I have referred to the experimental trip of the Princess Royal from Liverpool, the particulars of which were afforded me by Mr. Brebnor, of that town, and which I have subsequently met with in the Appendix to the Report of the Select Committee on Post-office Communication with Ireland (27 June 1842). The trip was made on the 20th June 1842. From Pier Head at Kingstown to Pier Head at Holyhead, the time occupied was 4 hours and 41 minutes; and between the same points, on the return voyage, 4 hours and 29 minutes, giving an average passage of 4 hours and 35 minutes. The same vessel made the voyage from Liverpool to Kingstown in 8 hours and 58 minutes, leaving the Clarence Dock at 2 minutes past 7 A. M. (19th June 1842), and arriving at Kingstown at 4 P. M.; the post-office packet, Urgent, which started at the same time, being 3 hours and 19 minutes longer in her passage to Kingstown than the Princess Royal.

Her run from Liverpool.

Speed of the Princess Alice.

The greatest speed of the Princess Alice* (running between Folkestone and Boulogne, a vessel of 274 tons burthen, 120 horse-power, and 6 feet draught), is 15 statute miles per hour through the water; and with a steam ship of similar build, 500 tons burthen, and 240 horse-power, a speed of 16 miles per hour may be calculated on in the present state of steam machinery. A steam ship of this class would, in favourable weather, accomplish a passage in four hours, from Holyhead 64 miles by the Platters, and with the average winds, in somewhat less from Porth-dyn-llaen, direct over the Kish; but as the starting of the mail-trains would be arranged for passages which might generally be calculated on for certainty throughout the year, or (to insure the greatest advantage of the sea communication) for one time of starting during the summer months, and another during the winter months, to which all the arrangements for the inland branches could easily be accommodated, I shall assume an average rate of 13 miles per hour for Holyhead, avoiding the race, which would be, on a distance of 66½ statute miles, 5 hours and 7 minutes; and in the case of Porth-dyn-llaen, with the advantage of the winds and less strength of tide, an average rate of 14 miles per hour, which, on the distance of 70½ statute miles, rounding the Kish Bank, would give for the voyage 5 hours and 2 minutes as the averages throughout the year. But as the regularity and rapidity with which the passages may be made will depend upon the build and power of the packets, and as expedition seems to be the primary consideration, steam ships of 400 horse-power should be employed, and of greater power than that in time of war.

Rate of the passage to Kingstown.

Class of steamers to be employed.

ON THE PASSAGE OF RAILWAY TRAINS ALONG THE MENAI BRIDGE, &c.

WITH regard to the effect of railway trains along the suspension bridge of the Menai, I shall briefly observe, that the sectional area of the main chains being 260 square inches, and the weight of the bridge (including 130 tons additional weight due to the repairs in 1839 and 1840,) 774 tons, the strain upon the main chains on the principle used by Sir Frederick Smith and Professor Barlow, amounts to rather more than five tons per square inch, *supposing the weight to be borne equally by all the chains, and without any allowance for*

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* I am enabled to give this statement on the authority of Mr. Field, of the firm of Messrs. Maudslay, Sons & Field, the builders of the engine.

for momentum produced by undulation, the effects of which upon the bridge by the gale in January 1839, are well known.

Strain on the bridge is greater than intended.

This weight is nearly 1 ton 16 cwt. per square inch more than was calculated upon in the evidence of Mr. Telford and Mr. Rennie, given before a Select Committee of the House of Commons (29th April 1819), and as their calculations were with reference to iron unimpaired in its elastic force, which, after the severe trials to which the structure has been exposed, cannot be said of the chains and rods of the bridge at present, it follows that the limits intended by its engineer have been (perhaps unavoidably) considerably exceeded.

Calculations for this structure should have no reference to the ultimate strength of the material, but to the limit of that strain upon it which, repeated year after year, would not produce an increasing tendency to injure its stability, independent of the effect of the elements and of time.

Liabilities to increase of strain.

I regard the bridge as having already upon it a greater strain than I should assign to a bridge under similar circumstances,—as being very liable to an increase of that strain from the weight being unequally distributed on the suspending rods and chains,—and subject to a still greater increase from any momentum produced by undulation, the effects of which I have referred to, and which momentum must be increased by railway carriages upon it, at such a time.

A gale similar to that of January 1839 would not probably injure the bridge to the extent which it then suffered; but it is quite certain the effects of it, even if they did not produce fracture, would considerably impair its stability.

Additional strain due to railway carriages.

The weight of railway carriages would be limited to one side or the other, and therefore the strain would be brought upon half the chains and suspending rods; and if a train passes without the engine, taking 10 carriages at five tons each, the extra strain upon the chains would be 85 tons, which on 130 square inches being equal to 13 cwt. per square inch, would make the total strain 5 tons 13 cwt. per square inch.

A gale would interrupt the land communication.

It may be perhaps stated, that during the prevalence of gales of wind the railway carriages would not cross (and I admit it will require some management to prevent the rails being disturbed at such times); but the great object of the Government and the country being that of establishing an *uninterrupted communication with Ireland* (to effect which so much discussion has arisen for saving a quarter of an hour by the sea voyage), my opinion is, that the precision of this communication by *land*, and the stability of a structure of which this country may be justly proud as a great step in practical science, ought not to be risked by a course which can be avoided whichever port is adopted. These conclusions, as I have before hinted, have no reference to the ultimate strength of the material, but they depend on the effects already produced, and on the results of experiments on the material of which the bridge is formed.

Of the Effect of any Bridge over the Menai on the Navigation.

The effect of any projected bridge upon the navigation of the Menai Strait would depend altogether upon the design and the arrangements connected with it.

Removal of the Swelly rocks recommended.

The impediments to the passage of vessels between Caernarvon bar and Beaumaris are such, that in this distance three pilots are required. The entire removal of the Swelly Rocks' and others which obstruct the passage, would considerably increase the traffic through the Strait, would act beneficially on Caernarvon bar, and *might* compensate for the obstruction which the piers of a bridge of large span would produce. Practically speaking, however, it must be observed that the construction of any bridge would be attended with great difficulties and expense—would be subject to great delay; and if time is an object in accomplishing the projected improvement in the communication with Ireland, a new bridge over the Menai is not very consistent with that object.

On the Railways which may connect the selected Port with the Metropolis, and Time occupied in the Transmission of the Mails.

The investigations of the Irish Railway Commissioners, of Sir Frederick Smith and Professor Barlow, including the Reports of the Engineers of the lines proposed, have furnished sufficient data for a conclusion on the points in this part of the inquiry.

Results by the Irish Railway Commission.

The results arrived at by the Railway Commissioners, respecting the lines from London to Holyhead and to Porth-dyn-llaen, and from thence by steam to Kingstown, are as follow, allowing

Thirty minutes from the Post-office in London to starting on the railway.

Thirty minutes from the railway to embark and sail, a rate of 27 miles per hour by railway, including stoppages, and 10 miles per hour for the voyage.

—	—	Time by Railway.		Length of Voyage.	Time on Voyage 30′ for embarking and sailing.		Inland Time.	
	Miles.	H.	M.	Miles.	H.	M.	H.	M.
Holyhead Line - -	272	10	35	63	6	48	17	23
Porth-dyn-llaen - -	260	10	8	70	7	30	17	38

Making a difference of 15 minutes, without allowing for the delay in passing the Menai Bridge, or for the effect of more favourable winds in the passage between Porth-dyn-llaen and Kingstown. If the 15 minutes (allowed by Sir Frederick Smith and Professor Barlow) for the delay at the Menai Bridge be added to the 17h. 23m, the time occupied in each line from London to Dublin would be the same.

The Commissioners, although they state that "the voyage from Porth-dyn-llaen would be shorter and more favourable in direction," have not, in their calculation, estimated any saving of time in the voyage on that account.

Mr. Cubitt, whose calculations are referred to in the same Report as corroborative of the conclusions of the Commissioners, estimated the time for performing the journey between London and Dublin by Porth-dyn-llaen and by Holyhead *as equal*, stating his opinion that "the former was in the best position of any for a passage between England and Kingstown harbour." Results by Mr. Cubitt.

The difference in any results depends upon the speed assumed; but leaving passenger trains out of the calculation, I shall take for the mail trains a speed on the existing lines which has been attained, and for any extension of those lines, a speed of which the application of the atmospheric principle will justify the expectation. Having witnessed the experiments at Wormwood Scrubs, I was prepared for a result highly creditable to the talents of Messrs. Clegg and Samuda, and to the energetic exertions of Mr. Pim, but not to the full extent which has been realized. Should the valve fully answer when in constant work, (and it will be tried more at Kingstown than on a principal line), the advantages of the atmospheric system may be regarded as certain. Results of the atmospheric principle.

The velocity attainable with safety will be considerably beyond that which can be so attained by the locomotive; the limit of that velocity, and of the weight to be moved, depending on the size of the air-pump and the diameter of the tube. Its advantages.

The inclination of the ascending planes is no impediment to its progress, causing only a temporary diminution of speed. To these advantages may be added the saving of the weight of the locomotive, and the impossibility of collision.

It offers therefore facilities for traversing, at a high speed, countries over which a railway with locomotive power throughout would be impracticable.

In calculating the rate at which the mail trains may be run as practicable, under strict regulations, 35 miles per hour may be taken on the Birmingham and Grand Junction lines; 40 miles per hour on the Great Western; and 50 miles per hour by the atmospheric, supposing that principle adopted from Didcot in one case, and from Chester in another: the distances and times may then be reckoned as in the following Table:— Rates of speed taken in the calculation.

—	Distance in Miles.	Speed by Locomotive Power in Miles per Hour.	Speed by Atmospheric Power, in Miles per Hour.	Time by Locomotive Power for the whole Distances.	Time by Locomotive Power to Didcot in the first case, to Chester in the second and third cases.	Time by Atmospheric Power from Didcot to Porth-dyn-llaen in the first case, from Chester to Porth-dyn-llaen in the second case, and from Chester to Holyhead in the third case.	Stoppages by the way, including in the third case 15 minutes for crossing the Menai Bridge.	Total Time by Locomotive and Atmospheric Power to Porth-dyn-llaen in the first case vid Worcester, in the second case vid Chester, and to Holyhead in the third case.	Time by Steamer to Kingstown from Porth-dyn-llaen or Holyhead.	Time lost embarking and landing Mails and Conveyances to the Dublin Post-office.	Total Time performing Journey between London and the Dublin Post-office, Atmospheric and Locomotive Power and Steamers.	Total Time performing Journey between London and the Dublin Post-office, using Locomotive Power for the whole distance from London to the Port of Embarkation.
				H. M.	H. M.	H. M.	H. M.	H. M.	M.	H. M.	H. M.	H. M.
I. From London to Porth-dyn-llaen by Mr. Brunel's broad-gauge line, vid Worcester, and proceeding by Dolgelly and Tremadock. According to the Report of Sir Frederick Smith and Professor Barlow - -	260½	*40	50	6 31	1 19	4 10	0 40	6 9	5	0 44	11 53	12 55
II. From London to Porth-dyn-llaen vid Chester, according to the Report of Sir Frederick Smith and Professor Barlow, deducting five miles, which Mr. Walker has suggested may be saved by deviations of existing lines -	269 76c	†36	50	7 30	5 2	1 46	0 43	7 28	5	0 44	13 12	13 54
III. From London to Holyhead vid Chester and the Menai Bridge, according to the Report of Sir Frederick Smith and Prof. Barlow, deducting 5 miles, which Mr. Walker has suggested may be saved by deviations of existing lines -	267	†36	50	7 25	5 2	1 41	0 55	7 38	5	0 44	13 22	14 4

* Deduced from performance of Great Western engines.

† Deduced from performance of engines on narrow gauge lines.

It will be seen that the advantages of transit, as they relate to time, are in favour of the route to Porth-dyn-llaen, *viâ* Didcot, Worcester, Dolgelly, Tremadoc, &c.

Reasons for assuming a high rate of speed.

Probability that a morning and evening mail to and from Dublin would be sufficient for commercial purposes.

With this view, half an hour is not important.

The above calculations are with reference to a high rate of speed consequent upon the importance attached to the rapidity of communication between the two countries, although the present arrangements for the transmission of the mails are not such as to warrant the conclusion that half an hour is of any consequence. The mails leaving London at the usual hour would arrive in Dublin at 9 A. M. These letters could not be answered in time for useful delivery on the same day, and there would be no object, in a commercial point of view, attainable by the mail returning within three or four hours after that time, as the letters would not be delivered in London until midnight; but a mail might leave each place at eight in the morning and at eight in the evening, by which arrangement all commercial purposes would be attainable. On this assumption, half an hour cannot be of great importance in the transit.

Importance of time for Government purposes.

Suggestion for Government communications in 4½ hours.

But *for the purposes of the Government* the case is very different, and to meet exigencies of political importance, I have devoted some time and thought, though the subject formed no part of your instructions. A system of signals by ships stationed across the Channel, if practicable, would continue a telegraphic communication between the two capitals; but if this is not attainable, the electric telegraph will convey communications by land, and from the adopted port for the packets, by one of the mail steamers, Government intelligence could be conveyed in less than 4½ hours.

Cost of the proposed arrangements.

The whole cost of this communication, to the importance of which no numerical value can be assigned, would be under 200 *l.* per mile, or for the whole distance by land between London and Dublin, under 54,000 *l.*

Public importance attached to the selection of a port and line of railway.

Although not strictly appertaining to my department, it is not irrelevant to remark upon the influence of the selection of either of the ports and lines of railways upon the districts interested, and the public accommodation. The importance of providing for competing lines of railway, and thus securing the public benefit, with due regard to the interests of the proprietors of these undertakings, appears to be an object worthy of an enlightened legislatura. With this view are made the remarks in the Third Report from the Select Committee on Railways, that "the power of encouraging, or if need be of creating competition, even although the remedy thus to be supplied might be partial, and must be costly, is nevertheless an engine of great capabilities in the hands of the State, and one which might be used to practical advantage in any case in which railways realizing very large profits should manifest a disposition to deal illiberally by the public;"* and the observations of the Premier himself, that "the true interests of society will best be protected by holding over them the checks of competition, and of the improvement that may take place in science," are in the same spirit.†

An opening for competing lines recommended.

In the present case, while the Holyhead line would shut out the practicability of competition, the adoption of the coast line to Porth-dyn-llaen by Bangor and Caernarvon would allow of the continuation of the Great Western line from Worcester, through the centre of North Wales to that port, thus opening between the metropolis and this port (if selected for Ireland), two railways, the Great Western and the Birmingham, which should embrace the greatest number of passengers and amount of traffic attainable, and at the same time open out that portion of the country, the resources of which are much greater in comparison than the other.

Experimental trips by steamers between Porth-dyn-llaen and Kingstown, recommended.

In concluding this Report I would beg leave to observe, that I have not deemed it within my province to notice in detail the extraordinary, and to me unaccountable statements and opinions, respecting the two ports which have come under my notice in the printed documents during this inquiry. For the same reason also I forbear to append to my Report, letters which I have received from parties upon the subject, and the general tenor of which is opposed to the adoption of Holyhead. It is evident that documents of this description may be congregated *ad infinitum* without advancing a single step towards a conclusion, more especially as practical means of solving any doubt are easily attainable; and as the only reasonable doubt which can exist as to the fitness of Porth-dyn-llaen for a packet station consists in the estimated time for performing the voyage, I would earnestly recommend that this should be set at rest by running a steamer of approved build and power between that place and Kingstown. A few trials of this description would have been more convincing to the Public Department interested in the result, than probably all the opinions which have been given on that branch of the subject; and until such trials shall be properly made it is evident that the most important practical proof will be wanting in arriving at a conclusion.

General deductions.

Upon other points of the inquiry, although I have endeavoured to treat them explicitly in this Report, yet to avoid any misconception I will ask permission to embody my opinions in a few words:

1. That Porth-dyn-llaen, whether with reference to position, natural capabilities, or economy in constructing works, is preferable to Holyhead as a harbour of refuge.

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* Third Report from the Select Committee on Railways, 1 April 1844.

† Speech of Sir Robert Peel, 5 February 1844.

2. That the surveys of Holyhead Bay by Mr. Thomas, R.N. in 1816, and Captain Beechey, R.N. in 1840, afford evidence of the accumulation of drift on the proposed site of the harbour of refuge at Holyhead, and also of drift or detritus from the River Alaw on the southern shore; and that it is essential to determine by geological investigation the proportion of the accumulation due to the drift from the sea and to the detritus from the Alaw, and what effects the causes of this accumulation will have on the depth of water in any proposed harbour in Holyhead Bay.

3. That although there is no appearance of any drift at Porth-dyn-llaen, and the sweep of the ebb-tide is favourable for maintaining a regular depth of water, the difference in one of the soundings on Lewis Morris's Charts, and that of Commander Sheringham, should be further investigated.

4. That although Holyhead is from 3 to 5 ½ nautic miles (according to the course taken) nearer to Kingstown than Porth-dyn-llaen is, yet the more favourable course from the latter, with relation to the prevailing winds and to the tides, warrants the conclusion that the passage to and from that port and Kingstown harbour would be performed in less time *on the average* than it would be between Kingstown and Holyhead, but that it is essential that well-conducted experimental passages between the two ports be made.

5. That the strain on the Menai Bridge is already greater than was intended by its engineer, and greater than it is advisable to assign to the bridge, considering its construction and exposed position; that this strain is liable to be considerably increased by unequal bearing, and that the passage of connected railway trains would be injurious to the general stability of the bridge.

6. That by the removal of the Swelly Rocks, advantages considerably more than adequate to the expense would be derived to the navigation of the Menai Straits and to the entrance over Caernarvon Bar; and this proceeding might compensate for the obstruction consequent on constructing a new bridge; but that the difficulty and expense attending the construction of such a bridge would be very great, and the time required not consistent with the intended object of communication.

7. That by the known means of railway transit by land, and powerful steamers by sea, the communication between London and Dublin can be effected in 12 hours; and by the same steamers and the means in use for communications by the *electric telegraph, intelligence between the two capitals can be conveyed within five hours.*

Lastly, That from the importance of the whole subject, whether with relation to a harbour of refuge, or to the communication between London and Dublin, the further investigation and experimental passages before referred to are required before a harbour and packet station, at either port, should be determined on.

I have the honour to be, my Lords and Gentlemen,
Your obedient Servant,

(signed) *Thomas Page.*

To the Right Honourable the Earl of Powis,
and the other Members of the Committee
of Noblemen and Gentlemen promoting the
best line of communication between London
and Dublin.

TABLE 1.—Of the Direction and Force of the WIND, and Number of Days during which each Wind prevailed in the Years 1841, 1842, and 1843, from the Register of Observations kept at *Holyhead*, showing how they may affect the Passages between *Kingstown* and *Holyhead*.

Note.—The Number of days is the sum of the three years, and the force of the Wind is the mean force, found by dividing the sum of the forces each day by the number of days.

BEAM WINDS, and Two Points before and Two Points abaft the Beam, taken as favourable Winds for a regular Passage both ways.

Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.	Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.
With the Flood:			With the Ebb:		
S S W	39	64×4·82=308·48	N N W	29	41×4·21=172·61
S b W	- -	7×3·20= 22·40	N b W	- -	8×5·47= 43·76
S	34	15×4·99= 74·85	N	36	33×3· 9=128·70
S h E	- -	7×5·20= 36·40	N h E	- -	15×3·52= 52·80
S S E	15	17×4·70= 79·90	N N E	24	58×4·02=233·16
		522·03			631·03
Winds available for both Passages, but more for Kingstown.					
With the Flood:			With the Ebb:		
S W b S	- -	30×5·=150·	N W b N	- -	15×5·84= 87·60
S W	122	159×4·23=672·57	N W	43	54×5·39=291·06
		822·57			378·66
Winds available for both Passages, but more for Holyhead.					
With the Flood:			With the Ebb:		
S E b S	- -	1×5·00= 5·	N E b N	- -	9×3·40= 30·60
S E	68	14×4·20=58·80	N E	32	41×3·16=129·56
		63·80			160·16
On the Bow against Kingstown and on the Quarter for Holyhead.					
With the Flood:			With the Ebb:		
S W b W	- -	44×5·07=223·08	N W b W	- -	15×4·50 67·50
W S W	37	155×4·5 =517·5	N W	43	54×5·39=291·06
		740·58			358·56
On the Bow against Holyhead and on the Quarter for Kingstown.					
With the Flood:			With the Ebb:		
S E b E	- -	2×3·00= 6·00	N E h E	- -	6×5·55 33·30
E S E	25	26×4·73=122·98	E N E	27	38×3·75=142·50
		128·98			175·80

TABLE 1—*continued.*

Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.
Head winds against Kingstown and aft for Holyhead.		
W b S	- -	34 × 5·58 = 189·72
W	68	30 × 4·55 = 136·50
W b N	- -	12 × 5·53 = 66·36
		392·58
Head Winds against Holyhead and aft for Kingstown.		
E b S	- -	30 × 5·70 = 171
E	56	36 × 4·13 = 148·68
E b N	- -	12 × 3·75 = 45·00
		364·68

TABLE 2.—Of the Direction and Force of the WIND, and Number of Days during which each Wind prevailed in the Years 1841, 1842, and 1843, from the Register of Observations kept at *Holyhead*, and returned to *Liverpool* by Telegraph, showing how they may affect the Passages between *Kingstown* and *Porth-dyn-llaen*.

Note.—The Number of days is the sum of the three years, and the force of the Wind is the mean force, found by dividing the sum of the forces each day by the number of days.

BEAM WINDS, and Two Points before and Two Points abaft the Beam, taken as the most favourable Winds for a regular Passage each way.

Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.	Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.
With the Flood:			With the Ebb:		
S W	122	159 × 4·23 = 672·57	N E	32	41 × 3·16 = 129·56
S W b S	- -	30 × 5·00 = 150·00	N E b N	- -	9 × 3·40 = 30·60
S S W	39	64 × 4·82 = 308·48	N N E	24	58 × 4·02 = 233·16
S b W	- -	7 × 3·20 = 22·40	N b E	- -	15 × 3·52 = 52·80
S	34	15 × 5· = 74·85	N	36	33 × 3·9 = 128·7
		1228·30			574·82

Winds available for both Passages, but more for Kingstown.

With the Flood:			With the Ebb:		
S b E	- -	7 × 5·20 = 36·40	N E b E	- -	6 × 5·55 = 33·30
S S E	15	17 × 4·70 = 79·90	E N E	27	38 × 3·75 = 142·50
		116·30			175·80

(*continued.*)

TABLE 2—*continued.*

Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.	Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.
Winds available for both Passages, but more for Porth-dyn-llaen.					
With the Flood:			With the Ebb:		
S W b W	- -	44×5·07=223·08	N b W	- -	8×5·47= 43·76
W S W	37	155×4· 5=517·5	N N W	29	41×4·21=172·61
		740·58			216·37
On the Bow against Kingstown, and on the Quarter for Porth-dyn-llaen.					
With the Flood:			With the Ebb:		
W b S	- -	34×5·58=189·72	N W b N	- -	15×5·84= 87·60
W	68	30×4·55=136·50	N W	43	54×5·39=291·06
		326·22			378·66
On the Bow against Porth-dyn-llaen, and on the Quarter for Kingstown.					
With the Flood:			With the Ebb:		
S E b S	- -	1×5·0 = 5·00	E b N	- -	12×3·75= 45·00
S E	68	14×4·20=58·80	E	56	36×4·13=148·68
		63·80			193·68

Winds.	Days in 1839 and 1840.	Days and Mean Force in 1841-2-3.
Head Winds against Porth-dyn-llaen, and aft for Kingstown.		
E b S	- -	30×5·70=171·00
E S E	25	26×4·73=122·98
S E b E	- -	2×3·00= 6·00
		299·98
Head Winds against Kingstown, and aft for Porth-dyn-llaen.		
W b N	- -	12×5·53= 65·36
W N W	69	45×4·83=217·35
N W b W	- -	15×4·50= 67·50
		350·21

ABSTRACT of the Number of Days, Direction, and Strength of the WINDS, taken from the Register of the Royal Observatory at Greenwich, for each of the Years 1837, 1838, 1839, and 1840; viz.

	West.		South West.		North West.		East.		South East.		North East.		South.		North.	
	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength
1837:																
January - -	1½	1.00	13½	3.93	2	3.50	0½	4.00	1½	4.50	6	3.58	4	3.87	2	2.25
February -	0½	6.00	12	4.54	2	6.00	2½	1.60	4½	1.89	0	0.00	4½	6.22	2	4.50
March - -	2	3.50	4½	4.77	4½	4.11	0½	2.00	1½	1.67	11½	3.83	1½	6.00	5	4.70
April - -	1	3.00	8	4.00	8	3.56	1½	3.00	1½	3.00	6	6.00	2	2.75	2	3.00
May - -	1	5.00	10	3.25	3½	3.86	1½	1.66	0½	2.00	6	3.50	1	2.00	7½	4.87
June - -	1	3.50	10½	3.43	3	4.00	7	3.64	0½	2.00	5½	3.55	2	3.00	0½	3.00
July - -	1½	3.33	12½	3.92	4½	3.00	2	3.00	0½	2.00	6	2.92	0½	8.00	3½	2.57
August - -	2½	2.60	10½	3.52	1	2.50	2½	2.20	1½	2.00	8	2.87	3	4.00	2	4.50
September -	3	3.50	8½	3.82	1	5.00	4	3.50	1½	1.67	8	3.00	1½	3.33	2½	3.00
October - -	5½	3.00	18½	2.54	1½	2.00	0	0.00	0	0.00	2	2.75	2	3.50	1½	4.67
November -	3	4.00	15½	4.23	4½	3.22	1	1.50	0	0.00	1	1.50	1	3.00	4	3.11
December -	1½	2.00	10	3.80	0½	4.00	1	1.00	6	2.08	6	2.58	4	2.50	2	3.50
	24	3.37	134	3.81	36	3.69	24	2.46	19½	2.28	66	3.28	27	3.93	34½	3.64
1838:																
January - -	1	1.50	3	2.50	0	0.00	3	5.17	3	2.67	14	4.07	4	3.62	3	2.50
February -	0½	1.00	3½	5.14	0	0.00	8	4.00	2	2.00	8	2.75	2½	4.60	3½	3 57
March - -	3½	4.43	7	4.29	6½	4.38	3	1.67	4½	2.67	3	2.33	0½	3.00	3	2.83
April - -	5½	3.00	4½	4.22	8½	4.94	1	3.00	0½	2.00	0½	7.00	1½	3.00	8	5.00
May - -	0	0.00	5	3.60	2½	3.60	3½	3.29	1½	4.00	7½	3.20	4	3.75	7	3.57
June - -	1	3.50	15½	3.48	2½	3.60	1	3.00	2	2.25	1	2.00	5	2.90	2	3.75
July - -	4½	2.78	13½	3.56	3½	3.86	0	0.00	3	1.67	0	0.00	3	1.83	3½	4.00
August - -	3	3.50	16½	4.39	8½	4.53	0	0.00	0	0.00	0	0.00	2½	5.20	0½	8.00
September -	4½	1.89	8½	1.94	0½	3.00	0½	2.00	0½	2.00	7½	1.80	4½	1.44	3½	2.71
October - -	3½	5.71	10½	4.09	4	4.62	0	0.00	0	0.00	7½	3.00	3½	1.71	2	3.50
November -	1	2.00	10½	3.57	1	2.50	2½	4.60	1½	6.67	11½	2.74	0½	2.00	1½	8.00
December -	5½	2.09	9½	3.47	4	2.75	2½	1.80	4	1.87	2½	2.20	2½	3.00	0½	4.00
	33½	2.67	107½	3.69	41½	3.78	25	3.17	22½	2.78	63	3.11	34	3.05	38	3.87
1839:																
January - -	5	3.30	11	5.14	7	4.50	0	0.00	0½	4.00	2½	4.60	0½	2.00	4½	3.67
February -	5½	2.73	10½	3.62	4	2.75	0½	3.00	2½	2.60	2½	4.00	2½	2.20	0	0.00
March - -	2	2.50	3½	2.71	4½	3 44	2½	3.40	0	0.00	10½	4.43	0	0.00	8	5.25
April - -	0	0.00	6	3.68	3	4.33	2½	2.40	0½	2.00	11½	4.08	2	3.00	4½	4.78
May - -	0	0.00	5½	2.45	4	4.00	1½	2.00	1	2.50	9	4.94	2	2.50	8	4.62
June - -	1½	5.00	10	3.40	2	6.00	3½	3.43	1½	2.67	6	3.17	4½	5.11	1	2.50
July - -	0	0.00	15½	4.09	2½	2.80	0½	6.00	3	3.67	2	2.00	5½	5.09	2	3.00
August - -	3½	2.86	10	3.65	6	2.90	0	0.00	1	2.00	0½	2.00	5½	2.73	5½	2.45
September -	4	2.75	15	4.37	0½	2.00	0½	2.00	3	3.33	0½	2.00	6½	3.23	0	0.00
October - -	0½	1.00	4	2.75	0½	2.00	2½	1 60	5	2.20	9	4.61	7	2.86	2½	5.20
November -	1	1.00	9½	2.26	2	3.25	4½	3.00	7	2.36	3½	3.43	2½	1.80	0	0.00
December -	2	2.00	9½	3.26	1½	2.33	5	2.50	5	3.00	3½	1.71	3½	2.28	1	2.00
	25	2.57	110	3.44	36½	3.36	23½	2.83	30	2.76	61	3.36	42	2.98	37	3.72

(continued.)

Abstract—*continued.*

	West.		South West.		North West.		East.		South East.		North East.		South.		North.	
	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days	Average Strength
1840:																
January - -	3½	4.00	13½	5.50	0½	4.00	2	2.00	0½	3.00	4	2.25	6	4.00	1	2.00
February -	1	4.50	9	3.83	0½	5.00	6½	4.15	1	4.50	6½	4.08	4½	4.43	0	0.00
March - -	2	2.50	3½	2.71	4½	3.44	2½	3.40	0	0.00	11	4.36	0	0.00	7½	5.40
April - -	3	2.17	5	2.00	2½	2.40	4	2.00	1	2.00	7	3.14	2	2.50	5½	4.18
May - -	1½	2.67	13½	3.44	2	4.25	2½	3.20	1½	2.00	3½	3.14	2	3.25	4½	4.47
June - -	3	3.00	15½	4.07	6½	4.31	0½	3.00	1½	3.00	0	0.00	3	2.83	0	0.00
July - -	8½	4.12	13	4.11	6	3.75	0	0.00	0	0.00	1	2.00	0½	4.00	2	2.75
August - -	7½	3.93	12½	3.20	0½	2.00	4	2.88	1½	2.33	3	2.83	1	6.00	1	1.50
September -	8½	3.05	12½	3.20	3½	2.57	0	0.00	0½	3.00	1½	3.00	1	4.00	2½	5.20
October - -	5	1.80	5½	2.36	7½	3.40	1½	1.67	1½	2.33	7½	2.29	1	4.00	1½	3.00
November -	2	3.75	12½	4.48	2	2.50	5½	2.00	2½	4.00	2	2.75	2	3.25	1½	3.66
December -	2½	2.00	6½	2.23	2½	2.40	7½	3.00	1½	1.33	7½	1.46	1½	1.33	1½	2.33
	48	3.12	122½	3.43	38½	3.34	36½	2.73	13	2.75	54½	2.85	24½	3.59	28½	3.48

The General Abstract of the Number of Days, Direction, and Strength of the Winds, taken from the Register of the Royal Observatory at Greenwich, for the Years 1837, 1838, 1839, and 1840; viz.

	West.		South West.		North West.		East.		South East.		North East.		South.		North.	
	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength	Days.	Average Strength
1837 - -	24	3.37	134	3.81	36	3.69	24	2.46	19½	2.28	66	3.28	27	3.93	34½	3.64
1838 - -	33½	2.67	107½	3.69	41½	3.78	25	3.17	22½	2.78	63	3.11	34	3.05	38	3.87
1839 - -	25	2.57	110	3.44	36½	3.36	23½	2.83	30	2.76	61	3.36	42	2.98	37	3.72
1840 - -	48	3.12	122½	3.43	38½	3.34	36½	2.73	13	2.75	54½	2.85	24½	3.59	28½	3.48
	130½	2.93	474	3.59	152½	3.54	109	2.79	85	2.64	244½	3.15	127½	3.39	138	3.68

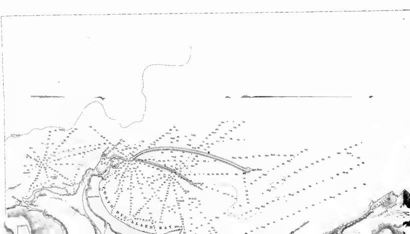
PLANS.

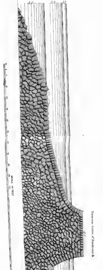
No 1.

LONDON AND DUBLIN COMMUNICATION.

PLAN OF THE BAYS OF PORTH-DYN-LLAEN AND NEVYN,

Shewing the Suggested Breakwater for a Harbour of Refuge.



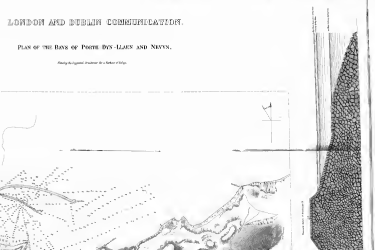


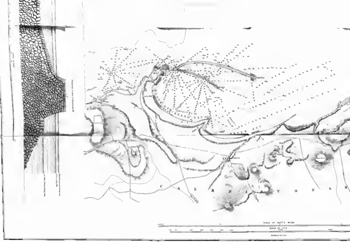
(BEFORE) LONDON & DUBLIN COMMUNICATION BY THOS PAGE Esq

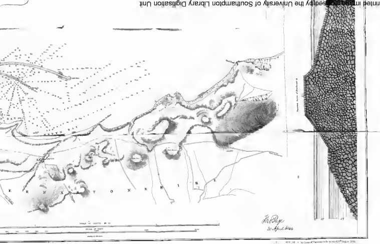
LONDON AND DUBLIN COMMUNICATION.

PLAN OF THE BAYS OF PORTH DYN-LLAEN AND NEVYN.

Showing the Suggested Breakwater for a Harbour of Refuge.




CAERNARVONSH
SCALE OF FEET



Thos Page
30 April 1844

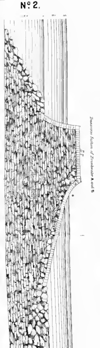
Ordered by the House of Commons to be printed, 8th August 1844.

N° 2.

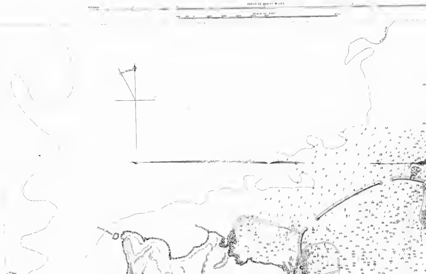
LONDON AND DUBLIN COMMUNICATION.

PLAN OF HOLYHEAD BAY.

Shewing the Suggested Breakwater for a Harbour of Refuge



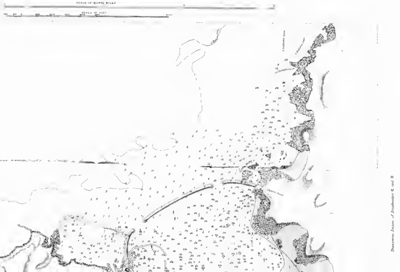
Transverse Section of Breakwater A and B

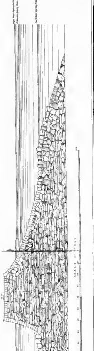


LONDON AND DUBLIN COMMUNICATION.

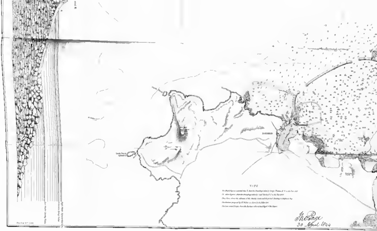
PLAN OF HOLYHEAD BAY.

Shewing the Suggested Breakwater for a Harbour of Refuge.





Transverse Section of Breakwaters C and D



NOTE

The Black Figures inserted thus 5 shew the Soundings taken by George Thomas [illegible] in the Year [illegible]

The Red Figures shew the Soundings taken by Capt. [illegible] in the Year [illegible]

The Lines shew the [illegible] of the [illegible] and the principal Soundings in [illegible] Bay

The Harbour proposed by [illegible] as shewn by the Yellow tint

The Lines [illegible] Purple shew the Harbour referred to [illegible] of the Report

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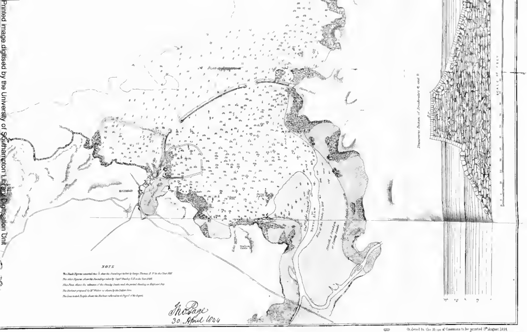

NOTE

The Black Figures inserted thus ⅓ show the Soundings taken by George Thomas R. N. in the Year [illegible]

The other Figures show the Soundings taken by Captn Beechey R.N. in the Year [illegible]

This Plan shows the advance of the Stanley Sands and the present Shoaling in Holyhead Bay.

The Harbour proposed by Mr Walker is shown by the Yellow Line.

The Line tinted Purple shows the Harbour referred to at Page 5 of the Report.

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30 April 1844

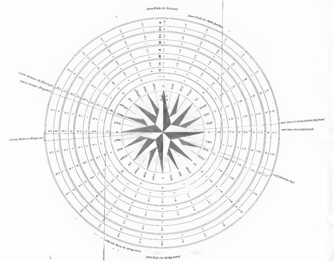
(233) Ordered by the House of Commons to be printed 9th August 1844.

Jas. & Luke Jas. Hansard, Print.

No 3.

LONDON AND DUBLIN COMMUNICATION.

Diagram Showing the Direction and Force of the Prevailing Winds



Circle I *Shows the Number of Days that each Wind prevailed for the years* 1839 and 1840
II *do do do* } 1841
III *Shows the Average Force of each Wind for the year*
IV *Shows the Number of Days that each Wind prevailed for the year* } 1842
V *Shows the Average Force of each Wind for the year*
VI *Shows the Number of Days that each Wind prevailed for the year* } 1843
VII *Shows the Average Force of each Wind for the year*
VIII *Shows the Number of Days that each Wind prevailed for the years* } 1844 Mar [illegible]
IX *Shows the Average Force of each Wind for the years.*

REFERENCE TO CIRCLES III V VII IX
- 0 *Calm*
- 1 *Light air*
- 2 *Light Breeze*
- 3 *Gentle Breeze*
- *Moderate Breeze*
- 5 *Fresh Breeze*
- 6 *Strong Breeze*
- 7 *Moderate Gale*
- 8 *Fresh Gale*
- 9 *Strong Gale*
- 10 *Whole Gale*
- 11 *Storm*
- 12 *Hurricane*

Thos Page
30 April 1844

Standidge & Co Litho London.

(623)

Ordered by the House of Commons to be printed 8th August 1844
Luke & G. Luke Hansard & Hansard Printers